Date: 4/14/2006

Katherine Greene
United States Army Core of Engineers
Project Manager
1325 J Street
Sacramento, CA 95814-2922

Dear Katherine Greene,

I am writing this letter to comment on an internal memo dated 6/28/2004 that I was provided with last week, which discusses the *numbering system for part of the 50 Series* buildings and the *Parkerizing process.*

The memos author Martin Fahning states that 57A; 57B, 57C, 56B and 56C are numbers that where created post military. "*The PA in an effort to be more detailed, has adopted the present day building number scheme…*" The current landowner created these numbers and therefore these numbers *would not reference any historic information in military / or government records*. The army used the numbers building 56 or 56A, which in many cases is just called building 56 in government drawings and records. What this means is that building "57A" is really part of building 56. It is my request and recommendation that the all reports be revised to the military numbering scheme to allow cross-referencing with historic records.

As you know TCE is one of the main contaminants in the Benicia Arsenal. It was stated in the attached memo that "Parkerizing does not include degreasing or the use of TCE". The research on Parkerizing®, which I have attached, will describe the process and prove that statement inaccurate. In fact Parkerizing® as described in patent 2,132,883 from 1938 by the Gerald G. Romig of the Parker Company discusses the use of solvents. *"This advantage makes it possible to combine the apparatus stages, in which pre-cleaning is performed, into one continuous unit with the coating stage, which of course, effects corresponding savings in floor space and a marked economy in construction and equipment costs."* The patent also states: *"Grease, etc., should be removed from the articles to be cleaned by my process. This may be accomplished by any of the well-known conventional means such as wiping or washing with a solvent, vapor degreasing, or alkaline cleaning."* The first claim of the patent *"The provision of a process for coating a series of pieces of ferrous metal with great rapidity and at minimum expense"* describes what I believe the need to combine this step into the process and why it was chosen for the Benicia Arsenal.

Parkerizing® is a trademark for the process of phosphating which an electro-plating process to apply a zinc or manganese coating. It is my belief that this process was performed all over the arsenal but especially in area "I" the industrial area. More specifically this electro-plating work was done in the following areas according to my research buildings, 31,165, 56, "57A", TO-131, 120, 161,48, 99, 99A, 91, and 91A.

Compiled into this report are files that I have generated based on my reading of the Records Research Report, the minutes of the RAB, the 50 Series Report, the PA, the expanded site SI, and internet research. As you will notice the documents attached are historic records and from known reliable sources. I have made limited comments, as I believe the documents speak for themselves. Please take a look at what I have put together and contact me so that we can discuss the content.

Thank You,

Randy Potter
Historic Arsenal Park, LLC

USACE - Sacramento

Memo

To: Meegan Nagy and Michael Mitchener (Benicia Arsenal Project Managers)

From: R. Martin Fahning (Technical Team Lead)

Date: 6/8/2004

Re: Discrepancies between the Records Research Report (RRR) and the recent Preliminary Assessment (PA) with regard to buildings 56, 57 and 57A at the former Benicia Arsenal.

Dear Ms. Nagy,

It has been brought to my attention that there is confusion about the description of Army activities between the RRR (Jacoby 1999) and the PA (BC 2004). This memo addresses the confusion with respect to operations in building 57 and 56. I have reviewed the two documents and the subject reference material and believe I can explain and clear up the confusion.

First let me explain by giving some background information on the subject buildings. The Arsenal was in operation for over 100 years and the 50 series buildings (known as building 55, 56 and 57) were in use for most of that period. Originally the 50-series buildings were connected by a narrow breezeway at the back of building 56. As more work shop space was needed several additional structures were added filling the space between the original buildings. This practice continued until sometime in the 1950's. According to historical records the Army identified only one of the structural additions with its own building designation (building 56A), all of the other additions simply increased the square footage of the 50 series buildings.

The RRR was scoped to gather historic information about Army activities at the Benicia Arsenal. This included identifying the use of chemicals and processes by reviewing historical records from local libraries and the national archives. In addition, former Arsenal employees and current property owners were interviewed. The practice of identifying the additions to the 50-series buildings with unique building numbers i.e. splitting building 56 into 57A, 57B, 57C, 56B and 56C is a post Benicia Arsenal practice. 1

Summary of Comments on Acr6670.tmp

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Sequence number: 1
Author: RPotter
Subject: Note
Date: 4/11/2006 9:38:14 PM

This states that 57A, 57B, 57C, 56B and 56C are numbers that where created after the military. The current landowner created these numbers and therefore these numbers would not reference any factual information in military / or governement records. If the records research was conducted using these numbers they wouldn't or shouldn't generate any information. In addition if the reports use these numbers no information can be cross referenced with military or government information. The accurate number to be used would be building # 56 or 56A which in many cases is just called building 56 in government drawings and records. Therefore any information provided in the historic records needs to be looked at from a departmental level inside of building 56 and potentially all of the 50 series buildings to have accurate historic / factual data.

The PA was scoped to update the RRR with additional information and make recommendations for either further investigations or no further investigation. This report draws much of the information about the 50 series buildings from the RRR. The PA, in an effort to be more detailed, has adopted the present day building number scheme. A portion of building 56 is presently called 57A. Please see attached figures for clarification of the location of these two areas. 1

This is confusing because the RRR associated building 56 with the Parkerizing room in which Parkerizing was performed and building 57 is associated with degreasing and the use of TCE (Trichloroethane). So it may have been assumed that building 57A (located between 56 & 57) contained both. 2

There are no Army records indicating the use of TCE in the Parkerizing room (Presently 57A) however; there are records identifying the use of TCE in Building 57 which is adjacent to 57A. The degreasing area is identified on "drawing 2994A, dated 26 September 1945" It shows the location of the cleaning room and cleaning solution vats within Building 57 (ref 634).

Secondly, Parkerizing does not include degreasing or the use of TCE. In fact; Parkerizing is a Phosphate etching process that produces a hard Matte finish that is both very durable and anti reflective. This process involves immersing the items in a solution that is heated to approximately 190 to 210 degrees and the dipping time can range from 5 to 45 minutes, depending on the hardness of the metal and the desired thickness of the coating. 3

Do not hesitate to contact me if you have any questions or comments. I can be reached at 916.557.6703.

R. Martin Fahning
Benicia Arsenal
Technical Team Lead

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Sequence number: 1
Author: RPotter
Subject: Note
Date: 4/11/2006 10:13:13 PM

While the labeling of this part of building 56 as building 57A adds specificity it has not been noted in the reports to clarify that this has been done and could lead someone to believe that this is what the military or the government called this portion of building 56. It is my suggestion that the label 57A be removed from all records, clarified to be part of building 56 so that it can be cross referenced, or relabled as the parkerizing room etc.

Sequence number: 2
Author: RPotter
Subject: Note
Date: 4/11/2006 9:53:14 PM

Buildings 55, 56, 57 have access to one another from the first floor from many locations. These doors and passages ways where necessary as the operation required parts or equipment to travel between departments and buildings to accomplish the rebuild work that was going on. What this means is that while building 55, 56, 57 have seperate numbers many of the same tasks where likely performed in adjoining building as necessity arose. It is my belief that the monorail that ran between buildings "57A" and 56 proves that. It is also my belief that parkerizing does include the the use of the solvents like TCE or Trichlorethane as part of the cleaning process prior to parkerizing. While building 57 had a TCE degreasor it likely took place in the parkerizing room as a step in the process.

Sequence number: 3
Author: RPotter
Subject: Note
Date: 4/11/2006 10:00:09 PM

The research document attached to this letter provided by the USACE which is from an internet search doesn't state that solvent isn't used. Just becuase it is not mentioned does not mean that it is not necessary to degrease with solvent such as TCE prior to parkerizing. Attached to this response is document produced in an internet search that I performed which states that its imperative to degrease prior to parkerizing (phospating) and goes into detail about what type of solvent should be used to accomplish this critical step. Does the government have any information on the parkerizing process in the form of a process description and diagram that would clarify how the parkerizing process was performed. From what I can find no information is provided in the reports that detail how this work was done and what chemicals, compounds, materials, etc where used. Should this information be available please provide me a copy of it to better my understanding of the process.

Just The Facts

Parkerizing or Phosphating is a metal finish that really gained in popularity during WW2 when the US Government was looking to replace the typical blued finish on most small arms with a Rust Resistant and Anti Reflective coating that would be both Durable and Abrasion Resistant and hold up in all weather extremes, for this they chose Parkerizing or Phosphating.

The Parkerizing technique is a Phosphate etching process that produces a hard Matte or Dull finish that is both very Durable and Anti Reflective and with excellent oil holding properties.

The most commonly types used are the original WW2 type, known as Grey Oxide and the latter Black Manganese, still in use by many Military and Civilian Manufacturers in many countries on a wide variety of products.

The standard Grey Oxide may range from light grey to a darker grey depending on the type and hardness of the metal it is being applied to, whereas the Black Manganese will usually always be in the Charcoal Black category.

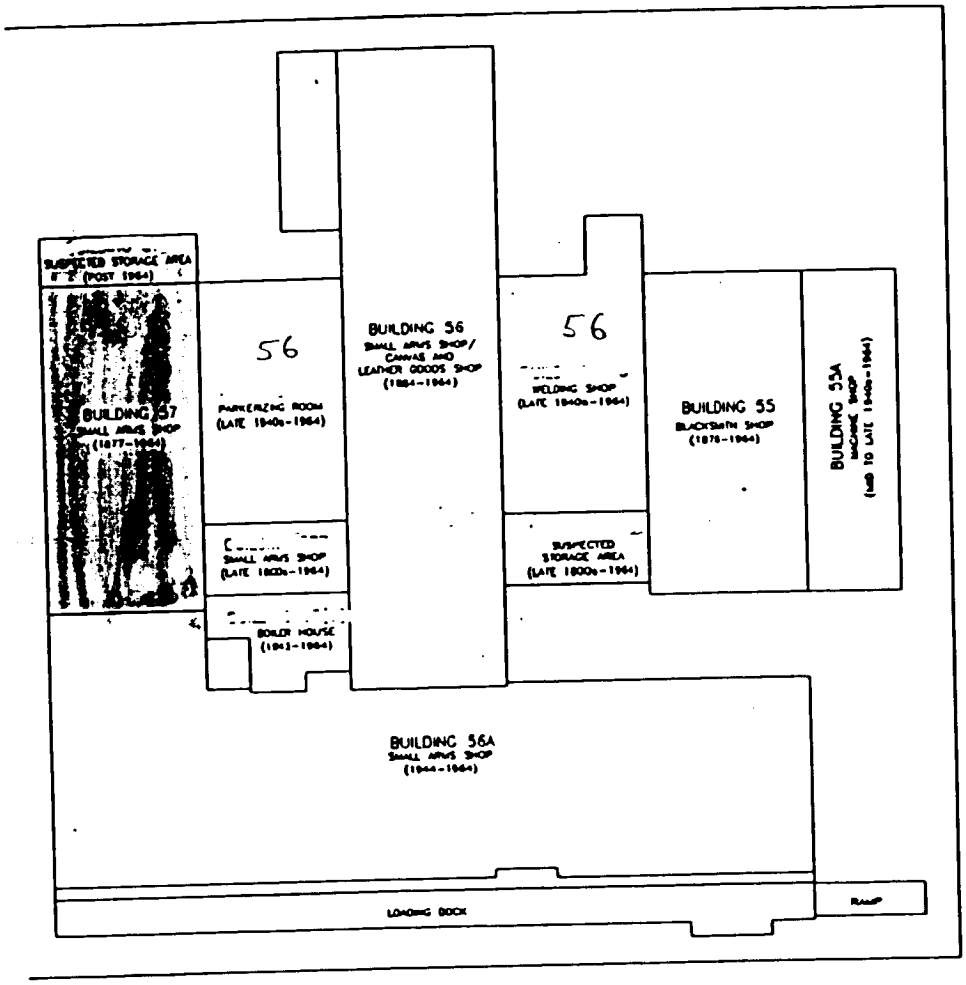
Either type of Parkerizing Finishes will offer much more protection from harsh weather than bluing, and is very simple to apply and maintain.

Parkerizing is much easier to use than bluing because as it is a Matte Finish the parts or items you want to Parkerize do not have to be polished, they can be acid dipped, sanded, bead blasted or sand blasted. In fact a lot nicks and scratches that would show up on a blued item would not even be seen after Parkerizing.

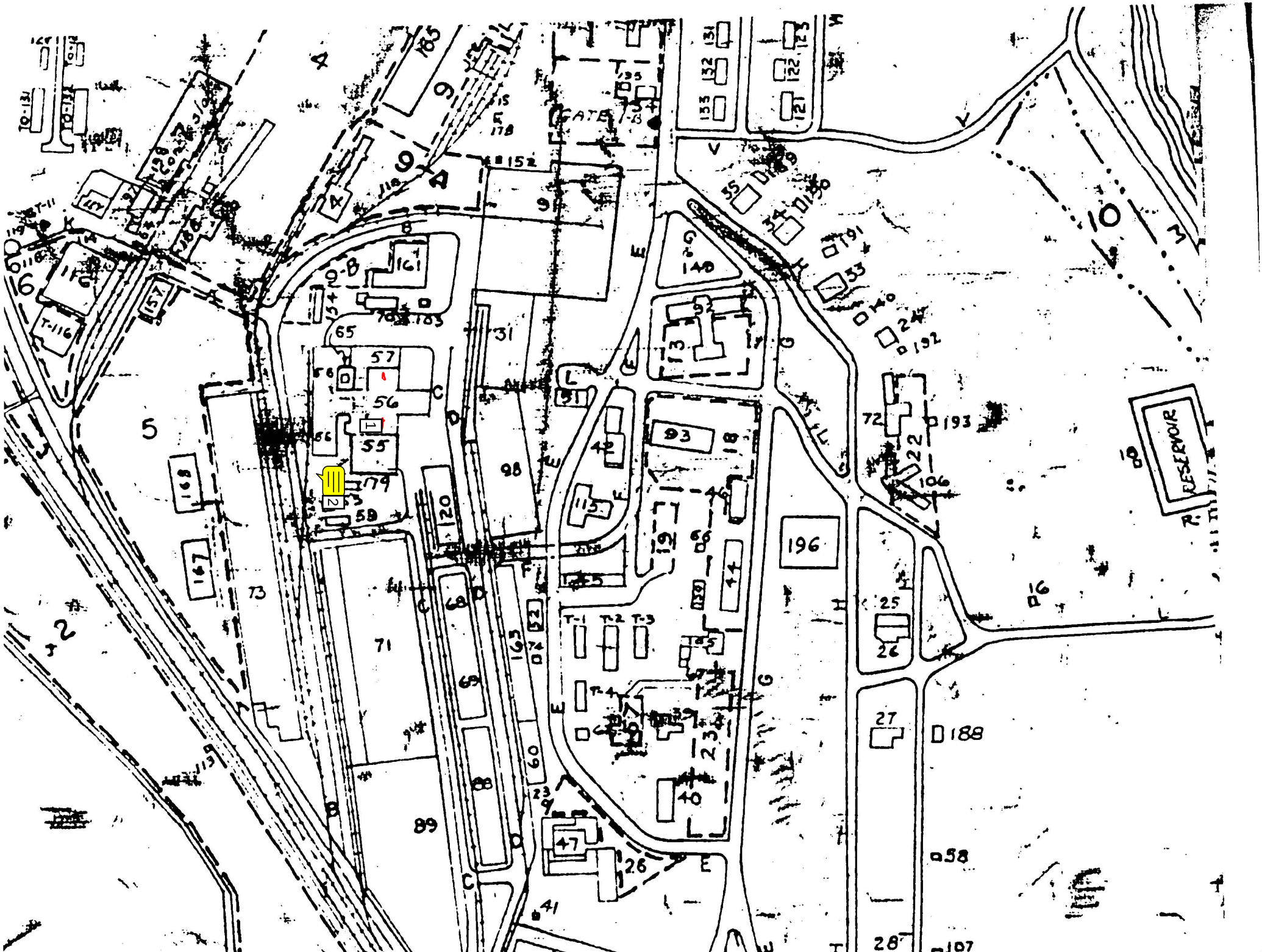
Parkerizing is an immersion process requiring the solution to be heated to approximately 190-210 degrees and the dipping time can range from 5-45 Minutes or so, depending on the hardness of the metal and the desired thickness of the coating.

It can be used on any type of Mild or Gun steel, it is not for use on Stainless or any types of Aluminum.

Parkerizing is sometimes refered to as black oxide, however this is a misnomer as black oxide is nothing more than a type of black bluing which does not offer the protection and corrosion resistance of a parkerized part



1940's to Present
(WWII)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Sequence number: 1
Author: RPotter
Subject: Pencil
Date: 4/11/2006 10:19:17 PM
Red dots are wings to building 56. The one on the left has been called "57A".

Sequence number: 2
Author: RPotter
Subject: Note
Date: 4/11/2006 10:16:31 PM
According to this drawing "56A" is just labeled as 56 which includes the wings off 56 that marked with red dots that I created on the drawing.

Start of Response to USACE Internal Letter Dated 6/28/04

Parkerizing

Wikipedia

Parkerizing

Example of Parkerized 45 ACP semi-automatic pistol

1

Parkerizing (also called **phosphating** and **phosphatizing**) is a method of protecting a steel surface from corrosion and increasing its resistance to wear through the application of an electrochemical conversion coating. Parkerizing is usually considered to be an improved zinc or manganese phosphating process, and not to be an improved iron phosphating process, although some use the term *parkerizing* as a generic term for applying phosphating (or phosphatizing) coatings that does include the iron phosphating process. Parkerizing is commonly used on firearms as a more effective alternative to bluing, which is another electrochemical conversion coating that was developed earlier. The Parkerizing process cannot be used on non-ferrous metals such as aluminum, brass, or copper. It similarly cannot be applied to steels containing a large amount of nickel, or on stainless steel. (See Passivation for protecting other metals.)

Application

The process involves submerging the metal part into a phosphoric acid solution whose key ingredient is often zinc or manganese, with varying additional amounts of nitrates and chlorates and copper. In one of the many processes that have been developed, the solution is heated to a temperature of 190-210 °F (88-99 °C) for a period ranging between 5 and 45 minutes. A stream of small bubbles is emitted from the metal

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Sequence number: 1
Author: RPotter
Subject: Note
Date: 4/11/2006 10:34:59 PM
Parkerizing is a trademark. Parkerizing is commonly known as phosphating or phophatizing.

part as the process takes place; when the bubbling stops, the process is complete. In addition to this particular processing temperature, there have also been various similar Parkerizing processes developed and patented that permit using either lower temperatures (for energy efficiency) or higher temperatures (for faster processing).

Appearance and usage

Zinc phosphating results in a non-reflective, light- to medium-gray finish. **Manganese phosphating** produces a medium- to dark-gray or black finish. **Iron phosphating** produces a black or dark gray finish similar to manganese phosphating. The grain size of the zinc phosphating is usually the smallest among the three processes, providing a more appealing cosmetic appearance in many applications. Many firearms that are Parkerized turn to a light greenish-gray color within a few years, as the coating ages, with the protective coating remaining intact. Cosmoline, especially, interacting with Parkerizing, can cause the highly-desired and attractive greenish-gray patina to develop on firearms that are stored in armories.

Manganese and iron phosphating coatings are usually the thickest electrochemical conversion coatings, being thicker than electrochemical conversion coatings such as zinc phosphating and bluing.

All of the electrochemical conversion coating finishes are not painted coatings, but chemically become part and parcel of the metal surface to which they are applied.

As for all electrochemical conversion coatings, the Parkerized surface must be completely covered with a light coating of oil to maximize corrosion and wear resistance, primarily through reducing wetting action and galvanic action. A heavy oil coating is unnecessary and undesirable for achieving a positive grip on Parkerized metal parts.

Alternatively, the Parkerized surface may be painted over with an epoxy or molybdenum finish for added wear resistance and self-lubricating properties.

Early history of Parkerizing (through 1942)

Development of the process was started in England and continued by the infamous Parker family in the United States. The terms *Parkerizing*, *Parkerize*, and *Parkerized* are all technically registered US trademarks of Henkel Surface Technologies, formerly Parker-Amchem, formerly Parker, formerly Parker Rust-Proof Company, formerly Parker Rust-Proof Phosphating Company of America, although the terminology has largely passed into generic usage for many years. The process was first used on a large scale in the manufacture of firearms for the United States military during World War II.

The earliest work on phosphating processes was developed by British inventors William Alexander Ross, British patent 3119, in 1869, and by Thomas Watts Coslett, British patent 8667, in 1906. Coslett, of Birmingham, England, subsequently filed a patent based on this same process in America in 1907, which was granted U.S. Patent 870937 in 1907. It essentially provided an iron phosphating process, using phosphoric acid.

An improved patent application for manganese phosphating based in large part on this early British iron phosphating process was filed in the US in 1912, and issued in 1913 to Frank Rupert Granville Richards as U.S. Patent 1069903.

Clark W. Parker acquired the rights to Coslett's and Richards' US patents, and experimented in the family kitchen with these and other rust-resisting formulations. The ultimate result was that Clark W. Parker, along with his son Wyman C. Parker, working together, set up the Parker Rust-Proof Phosphating Company of America in 1915.

Colquhoun of the Parker Rust-Proof Phosphating Company of America then filed another improved

phosphating patent application in 1919. This patent was issued in 1919 as U.S. Patent 1311319, for an improved manganese phosphating (Parkerizing) technique.

Similiarly, Baker and Dingman of the Parker Rust-Proof Company filed an improved manganese phosphating (Parkerizing) process patent in 1928 that reduced the processing time to 1/3 of the original time that had been required through heating the solution to a temperature in the precisely-controlled range of 500°F to 550°F. This patent was issued as U.S. Patent 1761186 in 1930.

Manganese phosphating (Parkerizing), even with these process improvements, still required the use of expensive and difficult-to-obtain manganese compounds. Subsequently, an alternative technique was developed by the Parker Company to utilize easier-to-obtain compounds at less-expense through using zinc phosphating (Parkerizing) in place of manganese phosphating (Parkerizing). The patent for this zinc phosphating (Parkerizing) process (utilizing strategic compounds that would remain available in America during a war) was granted to inventor Romig of the Parker Company in 1938 as U.S. Patent 2132883, just prior to the loss of easy access to manganese compounds that occurred during World War II.

Somewhat analogous to the improved manganese phosphating process improvements discovered by Baker and Dingman, a similiarly-improved method was found for an improved zinc phosphating process as well. This improvement was discovered by Darsey of the Parker Rust Proof Company, who filed a patent in February 1941, which was granted in August 1942, U.S. Patent 2293716, that improved upon the zinc phosphatizing (Parkerizing) process further. He discovered that adding copper reduced the alkalinity requirement over what had been required, and that also adding a chlorate to the nitrates that were already used would additionally permit running the process at a much lower temperature in the range of 115°F to 130°F, reducing the cost of running the process further. With these process improvements, the end result was that a low-temperature (energy-efficient) zinc phosphating (Parkerizing) process, using strategic materials which the United States had ready access to, became the most common phosphating process used during World War II to protect American war materials such as firearms and planes from rust and corrosion.

As a tragic aside, during the Great Depression, Parker Company co-founders Clark W. Parker and his son Wyman were found guilty of investor fraud. The details of the story were contained in a 20 July 1931 Time Magazine article: "Clark W. Parker and his son Wyman stood before Federal Judge John Munro Woolsey in Manhattan last week, were fined $11,000 each and sentenced to five years in Atlanta Penitentiary for conspiracy and using the mails to defraud. Worthless was not only $1,250,000 worth of stock in Automotive Royalties Corp. but also that of two previous companies Mr. Parker had formed. Many a mulcted clergyman sadly agreed when Judge Woolsey called him "an enemy to society." Swindler Parker shrugged." "[1]

The future of Parkerizing

Traditional iron phosphate, zinc phosphate, and manganese phosphate electrochemical conversion coatings, including Parkerizing variations, have all been criticized in recent years for introducing phosphates into ground water systems, encouraging the rapid growth of algae. As a result, in recent years, new, emerging technology alternatives to traditional phosphate coatings have started to see limited use, for replacing all phosphating coatings, including Parkerizing. The majority of these newer conversion coatings are fluorozirconium-based. The most popular of these fluorozirconium-based conversion coatings, introduced in 2005, incorporates the transitional metal vanadium. This new, more environmentally-friendly coating is referred to as a vanadate conversion coating. Besides vanadate coatings, arsenate coatings may theoretically provide similar protection, at the risk of being a health hazard to humans and animals. It remains to be seen if these, or other new electrochemical conversion coatings, will ultimately replace traditional phosphating and Parkerizing.

See also

- bluing
- passivation
- Phosphate minerals

External links

- Henkel Surface Technologies Current owner of Parco-Lubrite (a manganese phosphating process) and other Parkerizing rust-prevention coatings. (Parco is a registered trademark of Henkel Surface Technologies.)

References

A standard overview on phosphate and black oxide (bluing) coatings is provided in MIL-HDBK-205, *Phosphate & Black Oxide Coating of Ferrous Metals*.

- Budinski, Kenneth G. (1988), *Surface Engineering for Wear Resistance*, Prentice Hall, Englewood Cliffs, New Jersey
- Brimi, Marjorie A. (1965), *Electrofinishing*, American Elsevier Publishing Company, Inc., New York, New York.

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Parkerizing

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GUNPLUMBER'S GUIDE TO HOME GUNSMITHING: PARKERIZING OVERVIEW (revised 02-18-03)

INTRODUCTION

The gun finishing process commonly known as "Parkerizing" can be a fun and exciting process for both the home hobby gunsmith and the retail gun shop. Gunplumber's Guide will give you a better understanding of the process, and help you to decide if it is a venture you wish to undertake yourself. Arizona Response Systems offers high quality "Parkerizing" for firearms. Check the website for options and prices. You may have noticed my use of quotations around "Parkerizing." Parkerizing is a trade name owned by the Parker family, which developed the process in the late 1800s. It is currently owned by Parker-AmChem Company, but has become so common in today's language (like Xerox or Teflon or Frizbee) that it is frequently used erroneously as a generic term. The process covers a wide variety of phosphate deposition coatings. The most common for the military firearms industry are zinc and manganese phosphate, with iron phosphate coming in a distant third. The phosphate deposition process leaves a non-reflective coating on ferrous metal. This coating is an adequate protection against corrosion and abrasion in its own right, but additionally acts as a sponge to absorb oil for greater corrosion resistance and is an excellent primer coat for paint. The process can be adjusted to result in a variety of grain structures, from coarse to superfine, and in a variety of coating thickness usually measured in weight/surface area. Most commonly, it is an immersion process, but it can also be applied in a spray. Phosphates have excellent anti-galling properties as well. You cannot phosphate stainless steel, aluminum, brass, or copper. Best results are on carbon steel, "cold rolled" steel of the type found on most guns. Steels with high nickel content such as some older Winchester parts, may not take as well. Zinc phosphate is a light to medium gray, depending on hardness of base metal,. Manganese phosphate runs a medium to charcoal gray, as does iron phosphate. The latter two are a heavier grain structure and for that reason, even using a grain refiner pre-treatment, will usually give a coarser finish than zinc Nevertheless, the color of manganese phosphate is most popular with our customers.

REASONS FOR USE

Phosphate coatings are desirable to the home gunsmith because they are relatively easy to do, compared to hot bluing or baked on coatings, and relatively benign. They require lower temperatures (>200 F.) then bluing, do not "spit" like caustic salt bluing, and the acidic sludge is easy to collect for safe and proper disposal. Another benefit of phosphate coating is that the low operating temperature allows parts permanently bonded to plastics to be coated without melting as they might in baked-on coatings and hot bluing. HK cocking handles and retractable stocks, and StG-58 cocking handles are examples. One application of phosphate coatings that has been particularly useful in my business is to test questionable parts. There are some receivers and parts that are advertised as originals but are actually welded together from demilled components. Some weld jobs are beautifully surfaced and nearly impossible to detect visually, but if the item is phosphated, there will usually be a shift in color on the welded spot. Softer metals show up darker than harder metals and it is rare that a welded area will have the same color as the rest of the part. Silver soldered parts and brazing will also show up, where the braze line may have been covered by a different coating.

PROCESS DESCRIPTION

In its most basic form, an item to be phosphated is physically cleaned and degreased, sand blasted to bare metal, cleaned again, rinsed, dipped into a grain refiner (but NOT rinsed) and submerged in a heated tank of phosphoric acid and zinc (or manganese, etc). The acid starts a

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Sequence number: 1
Author: RPotter
Subject: Note
Date: 4/11/2006 10:41:29 PM
Process description details phsyical cleaning and degreasing.

pickling process on the surface of the metal, releasing gas and making a gas sheath of tiny bubbles around the metal. The dissolved metal come out of solution and adhere to the metal. Because there is some microscopic etching of the metal, the process is sometimes referred to as a "conversion process." The acid pickling the metal does microscopically dissolve the metal and use the released hydrogen to make the phosphate coating integral with the surface of the metal. I call phosphating a "deposition" process, because the coating thickness can be measured as greater than the original part. It does differ slightly from a deposition process such as painting or electroplating where another substance is laid over the surface. Those grains that do not adhere, called "flock" fall to the bottom of the tank and create an unusable "flocculent sludge." The sludge must be periodically filtered out of the tank. When the part stops bubbling (gassing) it is removed from the tank, rinsed, inspected, then immersed in a water-displacing oil and hung to dry or wiped down. If the part is to be painted, it is dried with compressed air and not oiled. The type of oil causes a change in color of the phosphate finish, darkening it (called "curing"). Color changes can also be induced through long-term storage. Cosomline (not a petroleum product, but a lanolin-based organic grease) and other gun-care products, as well as surface oxidation and years of cleaning and rubbing, cause phosphated surfaces to take on a greenish brown tint. This color, which I will call "patina" is one many gunsmiths wish to duplicate in restoring rifles, such as the M1 Garand.

EFFECT ON RIFLING

Because there is etching, however slight, custom, match grade barrels should probably be plugged. Use a rubber stopper in both ends, and if you have trouble keeping it sealed, use a brass threaded rod inside the barrel (steel might mar) and then slide your rubber bung over either end and tighten with a small nut and washer. Chrome-lining does not take phosphate coatings and the crud that appears on the inside of chrome lined barrels can be cleaned out with patches. Standard barrels will get a bit of crud in them, but cleaning and firing a few rounds will restore the inside finish to original.

BASIC EQUIPMENT

1

Cleaning Solvents
Cleaning Container
Sand Blaster
small parts basket
rinse tank (any material)
pretreatment tank (any material)
pretreatment chemical
processing tank (stainless steel preferred)
phosphate solution
heating unit
thermometer
safety equipment (gloves, apron, goggles, baking soda, etc)
oil tank
water displacing oil
drip area (towels, hangers, etc)

PROCESS DETAILS

2

Surface preparation is best obtained through degreasing the part in a solvent such as lacquer thinner, acetone, or a heavy scrubbing in hot water with detergent. Stamped parts that have been brazed together will often leach oil from between the joints, so the process may need to be repeated several times. Avoid solvents that leave a petroleum-based film on the parts.

Sandblast the part with an #80 aluminum oxide. You may also bead blast or skip this step

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Sequence number: 1
Author: RPotter
Subject: Note
Date: 4/11/2006 10:38:02 PM
Solvent is part is part of the basic equipment.

Sequence number: 2
Author: RPotter
Subject: Note
Date: 4/11/2006 10:42:49 PM
Degreasing using solvents is discussed and makes special note to avoid use of petroleum based solvents. TCE is not petroleum based.

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altogether, however I have had best results with sandblasted parts.

Clean the parts again by dipping in lacquer thinner. Have parts in baskets or wired. Avoid touching with your fingers as the oil from your skin will mar the finish.

Rinse parts again in hot water (boiling if possible), but only when ready to immediately process, to avoid flash rusting.

Immerse parts in the pre treatment (rinse conditioner - usually a titanium dioxide solution) per manufacturer's instructions - usually a few seconds. Do not rinse - put directly into the phosphate bath.

The phosphate bath is best heated by an industrial immersion heater. This is very expensive. Heating over flame or external electric element can cause hotter spots in the tank, which will cause a hardened buildup of sludge. For low volume, it may not be cost-effective to use an immersion heater. Also, a stainless steel tank will not react to the solution as a cold-rolled steel tank will. However once a layer of phosphate has built up on the surface, it becomes non-reactive.

Bath temperatures are going to depend on the particular brand of solution, coating thickness desired, and immersion time. This is where the technical side of phosphating far exceeds the requirements of the home gunsmith. Typically, the hotter the solution and the longer the immersion time, the heavier the coating. However too high a temperature will increase the amount of phosphate expended that does not adhere to the surface of the metal, but falls away as flock. You must not allow the solution to boil. I have used a variety of brands, and find that 180 F. for 10 minutes is a good starting point. Raise the temperature (max 190 F) or increase the immersion time. It is of no value to keep a part in a tank after the gassing has stopped, as no further reaction will occur. After 15 minutes, you can remove the part even if minor gassing continues, as longer immersion may start to etch the part.

Remove from tank. Rinse in clean, cold water. There may be a thin layer of white flock on the parts, which can be rinsed off or scrubbed off with a soft brush and rinse water. Inspect the part. If there is a minor flaw, the specific area can be cleaned and blasted again, then the whole part returned to the solution. Only the re-prepped portion will undergo a reaction. If a large area is flawed, then it is best to blast the whole part and start again.

If the parts are going to be painted, blow all water off with an air hose. paint as soon as possible because the virgin material is subject to a dusting of rust if not oiled. Sometimes this dusting is caused by impurities in the rinse water oxidizing, however unless you have an inexpensive supply of purified water, it is not significant enough a problem to justify the added cost of super-filtered/distilled water. Immerse the part in water displacing oil. I prefer WD40, although a number of special "curing oils" are available.

Hang part to dry, or dry with lint-free towels. I prefer newspapers for the bulk of the oil, and blue paper shop towels for final wiping.

TIPS

After initial phosphate mixing per manufacturer's instruction, replace water lost through evaporation and steam. Mixing a little extra solution beforehand can help to top off a tank after it has been filtered. If coating thickness seems to decrease over time, add more of the concentrate solution.

Typical phosphate solution concentrate is about $25 per gallon and enough to do 20+ rifles. If an accurate measure of the reactiveness of the solution is desired (total acid to free acid

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Laquer thinner is discussed as a cleaning solution since TCE in 2003 was likely not easy to come by and is hazardous.

ratio), you will need to buy titrating equipment - see advanced techniques section.

An 18 gauge black iron tank from Brownells lasts me about 6 months of heavy use before the acidic solution eats through the tank. The life of the tank can be greatly increased by storing the phosphate solution in plastic buckets when not being used.

Practice with handguns, magazines, or small parts, on the kitchen stove with a $20 stainless stock pot or porcelain canning pot. It is easier to learn with small containers and you have less up-front investment if you decide against continuing.

A new solution will not produce an appropriately thick coating until conditioned, either by processing non-important parts, or the one-time addition of a little steel wool or iron powder, usually in a low temperature tank for about an hour - see manufacture's suggestions for details.

Five gallon buckets make good rinse tanks. You can fill buckets from your bath tub, which produces adequately hot water if you do not want to heat your initial rinse tank to boiling.

To do a small part, a coffee cup with enough solution to cover the part can be heated in the microwave. I've never had a submerged metal part cause arcing in the microwave oven, but you may wish to heat the solution first, then drop the part in. Keep covered with a paper plate to avoid splattering solution inside oven, if it boils. Clean cup well before using for food.

A Tupperware butter cover works well for StG58 cocking handles (plastic-metal bond)

Plastic planters from your garden shop can be used for rifle rinse tanks or grain-refiner tank.

You can skip the grain refining step, if you don't mind a slightly coarser texture

You can go directly from the blaster to the phosphate tank if you don't mind a coarser texture, increased sludge creation, and slightly erratic coating thickness. I do this when I process my shop tools that are starting to rust or other applications where cosmetics are unimportant.

If using a gas heater, keep the fans away from the flame as it will make it hard to maintain a consistent temperature.

A 40" Brownells tank fits diagonally on many kitchen stoves. Keep stirred as the heating elements will not hat the tank evenly.

If you are setup to do handguns, and need to do a rifle-length part, repeatedly pouring the hot solution over the rifle barrel, held vertically, may work in a pinch. You can also transfer your hot solution to a plastic planter or fiberglass (wallpaper supply store) tank to hold the rifle. In industry, large parts are often coated by a car-wash type spray process.

SAFETY ISSUES

Have excellent ventilation. The steam from the phosphate bath is slightly corrosive and can oxidize tools and even etch contact lenses with continuous exposure.

The phosphate solution is poisonous

The phosphate solution is acidic. If you get it on you, rinse well and neutralize with baking soda. Wear gloves goggles, and an apron. I don't bother with the apron and only use gloves if I have to fish something out of the bottom of a hot tank, but eye protection is a must. Follow

the manufacturer's specific precautions. I've fished parts out of a 140 F tank with bare hands to no ill effect, but people have different sensitivities to the acid. I have also spilled a large quantity on my pants and received minor burns - like a sunburn, which no amount of rinsing eased - baking soda cooled it off.

Did I mention ventilation? Los of it - fans and more fans!

CLEANUP

As long as your flocculent sludge is not settled on your parts, it will not affect the process. However it eventually should be filtered out. After cooling, the sludge will settle to the bottom and the clean solution can be siphoned off the top. I siphon through large coffee filters. Keep your wet sludge in an open bucket. The water will evaporate off and minimize the amount of hazardous waste that must be properly disposed.

COLOR CHANGING

Preheat an oven to 400 degrees. dip your gray part in a medium weight oil, like motor oil. dry thoroughly. place part in oven for 20 minutes. Inspect. Increase time if necessary, checking every 5-10 minutes. As the oil burns, it darkens the surface of the metal, aging it to a green-brown tint. Consider the ramification of doing this in your kitchen oven (smell, angry wife, etc.) before trying. Wiping with Cosmoline, grease, or a variety of other petroleum products and dyes can affect the finished color. Experiment. I find Castrol amber wheel bearing grease to give a nice patina.

ADVANCED TECHNIQUES: TITRATING THE BATH (draft)

Two 50ml graduated burettes in appropriate stand. 100 ml conical flask 10 ml pipette .01% Chromic acid 50 ml glass or clear plastic dropper bottle Normal 10 sodium hydroxide reagent grad phenolthalene Bromophenol blue 75% technical grade phosphoric acid sodium bicarbonate or sodium hydroxide)(flake or pearl) Titrating for free acid content: Put 5 drops of phenothalene into 10ml burette of phosphate solution. Add additional drops until solution turns pink and holds color for 15 seconds. Total ml is your free acid number. Titrating for total acid content: Repeat, starting with 5 drops of bromothalene blue. May take 20-30 drops to change color. Total ml is your total acid number. total acid : free acid 4-6:1 5:1 ideal To increase free acid content, add 75% technical grade phosphoric acid, or more of your concentrate. To decrease free acid content, add sodium hydroxide or sodium bicarbonate, or dilute tank with water.

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Table 2

WATER CONSUMPTION RECORDS
1950 - 1951

Month	Purchased[a] 1000 gal.	Produced Total 1000 gal.	Produced Treated 1000 gal.	Total Consumed 1000 gal.
July, 1950	22	6042	1927	6064
August	16	7524	2580	7540
September	67	7023	2745	7090
October	39	8571	2955	8610
November	76	9857	3127	9933
December	91	9344	3600	9435
January, 1951	78	8886	3257	8964
February	108	7908	3102	8016
March	92	9612	3825	9704
April	123	10966	4017	11089
May	87	11846	4683	11933
June	117	11754	4296	11871
July	100	11057	4715	11157
August	271	13183	5792	13454
September	1794	6074	890	7868
October	8295	1355	181	9650
November	10473	689	84	11162

[a] *Water is purchased from the California Pacific Utilities Company*

When industrial wastes are present, the Manual calls for an additional allowance based on a study of the characteristics of the wastes. At Benicia Arsenal a number of activities, if not carefully controlled, may produce enough liquid wastes to pollute the disposal waters or upset the operation of a treatment works. For that reason, a special study of waste producing operations was undertaken and the results thereof are reported below.

The primary functions of the Arsenal are storage, maintenance and repair, and packaging and shipping. Waste producing activities are found only in the function of maintenance and repair. In this function, combat vehicles of all types and other war equipment are brought to the Arsenal to be renovated. Equipment which has been in storage for extended periods is also reprocessed as required. The various units are cleaned, overhauled, tested, and protected for storage or shipment. Processes used for these purposes are as follows:

1. Steam cleaning
2. Degreasing
3. Dipping
4. Preserving
5. Painting

Equipment is normally steam cleaned preparatory to repair, renovation or disassembly. Degreasing is achieved by means of a vapor process and is used to clean small parts, such as small arms, gears, and bearings.

Depending on the results desired, equipment is dipped in a bath containing caustic or acid. Equipment thus treated includes the larger vehicle component or parts such as gear housings, axles and fenders. Caustic baths are also used for degreasing and for paint stripping and removal of tar. Phosphoric acid is used for rust removal and as an inhibitor prior to painting. Hydrochloric acid baths are used for more rigorous rust removal such as cleaning radiators and gas tanks.

Preserving involves the application of moisture resistant covering to metal surfaces for rust prevention. Smaller pieces are dipped into either hot or cold baths of preservative material. Other pieces, such as metal tubing, are sprayed with light oil. Wax may also be applied. All sorts of parts and equipment are spray painted in special paint booths.

Table 3 presents the results of a careful survey of all buildings found to contain some or all of the above processes. With the exception of Building TO-131, the floor drains of all buildings are connected with the storm sewerage system. Some of these, as later enumerated, should be disconnected from the storm system and reconnected to the sanitary system after installation of suitable traps.

Most of the steam cleaning work is carried out in Buildings 161 and 165A. At present, the maximum capacity of Building 161 is estimated to be 30 pieces of heavy equipment, such as trucks and tanks, and 20 pieces of smaller equipment per shift. At Building 165A the corresponding capacity is 20 general purpose trucks per shift. At both buildings a cleaning compound (Spec. ES 542B, Amend. 1) is injected into the steam during cleaning operations. This compound consists of a soap which acts as a weak alkali and should therefore cause little trouble in treatment of the waste. On the other hand, oil, grease and grit removed during cleaning should be removed before the liquid is discharged to the sewer. A standard grease trap with facilities for easy removal of grease and grit should

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This page is taken from the records research report and discusses cleaning and preserving almost in the same sentence as they are critical to be performed in a continouos process or one immediately after another. I believe this is to prevent rust from forming.

Patented Oct. 11, 1938 2,132,883

UNITED STATES PATENT OFFICE

2,132,883

METHOD OF COATING FERROUS METAL WITH A WATER INSOLUBLE METALLIC PHOSPHATE

Gerald C. Romig, Elkins Park, Pa., assignor to American Chemical Paint Company, Ambler, Pa., a corporation of Delaware

No Drawing. Application April 30, 1937, Serial No. 139,947

12 Claims. (Cl. 148—6.5)

This invention relates to the art of applying phosphate coatings to the surface of iron or steel, and particularly to the art of producing these coatings on a succession of pieces by treating them with an aqueous acid phosphate solution such, for example, as zinc phosphate.

Among the objects of the invention the following are particularly noted:

1. The provision of a process for coating a series of pieces of ferrous metal with great rapidity and at a minimum of expense.

2. The provision of a method for producing coatings of extreme uniformity on a long succession of pieces, by means of a solution which is continually used for the purpose and always maintained in perfect operating condition. In connection with this object it is the aim of the invention to maintain the solution entirely uniform with respect to its coating characteristics, even though the solution may undergo a considerable change in its chemical composition.

3. The provision of a method by means of which it is possible to achieve a very rapid coating operation without resorting to the use in the coating solution of accelerating agents, such as metals less basic than iron and/or oxidizing agents such as nitrates, permanganates, etc., which, heretofore, have been commonly employed in phosphatic coating operations. My invention thereby makes possible ease of control and economy of operation, and avoids the presence of deleterious metals in the resultant coating.

4. The provision of a method which is especially suited to the production of very fine-grained, smooth phosphatic coatings on chemically cleaned iron or steel surfaces such as surfaces which have been cleaned in an alkaline cleaning solution, without necessitating drying, rubbing, wiping, or brushing prior to or during their treatment with the phosphatic solution.

The solution employed in the process of the present invention may comprise a phosphate of a metal such as zinc or manganese. For certain practical and commercial reasons I prefer to use zinc phosphate, because of its more ready availability and relatively lower cost. Therefore, in the following description, I will refer to zinc phosphate, although it is to be understood that the same principles may very well be applied to other metals of a similar nature.

Briefly stated, the process, in its preferred form, comprises subjecting a succession of iron or steel pieces serially to the action of an aqueous zinc phosphate solution, while substantially continuously adding to the solution, regulated quantities of the zinc phosphate solution and of a water solution of a salt of nitrous acid, which additions are made in an amount which is sufficient to maintain the metal content and the pH of the solution substantially constant and also substantially free of dissolved iron.

The presence of small amounts of foreign anions in the solution is generally quite harmless, but large amounts of sulphates, chlorides, or ions of other strong acids must be avoided.

Foreign cations, especially of metals more basic than zinc, are almost entirely without influence on the process. For instance, large quantities of the ions of alkalis and ammonium do no harm.

A satisfactory continuous operation of the coating process on a succession of surfaces depends on maintaining the solution constantly in its optimum condition. However, certain factors, to be discussed below, which are directly helpful in accelerating and improving the coating action are antagonistic to the maintenance of the solution in the best possible working condition. Some compromises, therefore, have been found to be necessary in order to maintain uniformity of results in the continuous operation of my process, and my invention makes possible the adoption of these factors with their incidental advantages in spite of what otherwise would be their disadvantages.

Before proceeding with a more detailed description of my improved process, I wish to state that extensive experiments have shown that when a dilute solution of zinc phosphate, which is substantially saturated at room temperature, is heated for some time, it gradually precipitates a phosphate of zinc containing a higher ratio of zinc to phosphorus than the solution from which it precipitates. In other words, the hot solution is supersaturated with respect to the zinc phosphate which precipitates. As the precipitation proceeds, the solution rises in hydrogen ion concentration (falls in pH) due to the greater proportionate loss of zinc. This action continues until the solution has again reached equilibrium at the elevated temperature.

The rate at which such a hot zinc acid phosphate solution loses its supersaturation is accelerated by a number of factors such as the presence of crystalline precipitates of certain kinds, violent agitation, high temperature, and the presence of certain dissolved materials, notably dissolved iron.

I have discovered that rapid coating of iron or steel surfaces with solutions of this character proceeds best when the solution is supersaturated. I have likewise discovered that the utmost speed of coating action is obtained by rapidly renewing the film of solution actually in contact with the surface which is being coated. This can be accomplished by any means which causes a rapid relative motion of the solution and the surface, but I prefer, because of its simplicity and its effectiveness in producing this result, to impinge the solution onto the surface.

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This is a patent for Phospating (parkerizing) that discusses the process in detail. The patents first claim is for coating of series of pieces of ferrous metal with great rapidity and at a minimum expense. The process uses a slightly different solution or mixture and is performed in a continous fashion.

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To this end I employ suitable spraying equipment and a pump for circulating the solution from a reservoir to the spraying nozzles, the solution which runs down from the work being caught in suitable troughs and subsequently returned to the reservoir for recirculation. Equipment of this kind is well known in the art and need not be specifically described or illustrated, especially since it can take any one of a number of forms, dependent upon the particular installation.

The highest coating speed is likewise favored by elevation of temperature, up to the boiling point, and for best results the temperature of the solution should be quite accurately controlled. However, as above indicated, elevated temperatures have a tendency to cause the solution to lose its supersaturation, for which reason I prefer a temperature somewhere between 160° F. and 190° F., because my experience has shown that a temperature within this range will yield coatings in a period which is sufficiently brief without causing the extremely rapid loss of supersaturation which occurs at higher temperatures.

Violent agitation of the solution tends to speed up somewhat the rate at which it loses its supersaturation and falls in pH. Nevertheless, rapid renewal of the film of solution actually in contact with the surface of the metal, and the more or less violent agitation which it necessitates, is still considered desirable, since the great increase in coating rate so obtainable is a sufficient advantage to more than compensate for the additional difficulty which it entails in the proper maintenance of the solution. Rapid circulation by means of a pump and the violent agitation incident thereto as well as to the impingement from spray nozzles such as suggested above, present this problem of loss of supersaturation, but even so I consider them to be desirable.

In addition, the elevation in temperature, as mentioned above, has a bearing upon the loss of supersaturation, but here again I prefer to use the temperatures indicated above in connection with my improved process.

In the continuous operation of my process another problem arises in that the solution, in acting upon the iron or steel surfaces of a succession of pieces, dissolves some of the iron, and I have discovered that this dissolved iron has such an accelerating effect upon the rate of loss of supersaturation as to make its removal essential.

The removal of the iron from the solution may be effected in a number of ways, such, for example, as by the addition to the solution of chemicals capable of precipitating the ferrous iron or of oxidizing the ferrous iron to ferric iron, the latter being practically insoluble in the solution. Furthermore, adequate aeration of the solution may also be employed in removing the iron. I prefer, however, to precipitate the iron by adding a suitable chemical, and the chemical I employ has an added function which will be described below. I wish it to be understood, however, that whatever aeration takes place in the carrying out of my process, especially where the solution is impinged upon the work, may have an important bearing upon the precipitation of insoluble ferric iron, and to the extent that aeration accomplishes this end, I am enabled to save expense by employing a minimum quantity of the preferred chemical to be described below.

As a result of the operation of the various factors described above, there exists, during the coating operation, a continuous tendency for the solution to become more acid, i. e., to fall in pH. At the same time the solution tends to become depleted in zinc content, partly due to useful deposition of insoluble zinc phosphate on the metal to be coated, and partly to the continual precipitation of zinc phosphate from the solution in its attempt to relieve the supersaturation. For these reasons, it has been found necessary, in order to maintain the solution in perfect operating condition, to continually add to the solution a substance or substances capable of preventing this increase in hydrogen ion concentration (fall in pH) as well as a substance or substances capable of maintaining at a substantially constant value the zinc content of the solution.

While it is possible to add these substances intermittently, yet such addition may allow the composition of the solution at certain times to fall outside the optimum range. Moreover, owing to the effects of local concentration, etc., on adding comparatively large amounts of restoring chemicals at one time, the local balance of the solution is so disturbed that zinc is uselessly lost and chemicals uselessly consumed. A marked increase, both in the uniformity of the coatings obtained, as well as in economy of chemical consumption, is obtained by adding both types of chemicals substantially continuously. This is especially true of the chemical for maintaining the pH substantially constant.

It is likewise preferable to add the chemicals to the coating solution at a location where it is in a state of vigorous agitation.

The solution is capable of operating successfully at a given pH over a considerable range of zinc concentrations, but at a given zinc concentration the solution operates correctly only within a narrow pH band. Too high a pH, in general, causes useless precipitation of zinc phosphate, while too low a pH causes the process to become inoperative.

The precipitating agent which I prefer to employ is a salt of nitrous acid, because such material will function not only as a medium for converting ferrous iron into insoluble ferric iron, but also as an agent for maintaining the pH of the solution substantially constant. Sodium nitrite is particularly suitable for the purpose, and I prefer to introduce it as a freshly prepared water solution. Barium nitrite or calcium nitrite may also be employed, or some other water soluble salt of nitrous acid.

As above pointed out, effective aeration of the solution, such as occurs during an impinging method of applying the solution to the surface to be treated, will have a marked effect on the precipitation of ferric iron, and the extent to which this effect can be availed of, will, of course, make possible a corresponding reduction in the quantity of the nitrite solution which may be required.

It will be noted that the continuous addition of the precipitating chemical may give rise to the presence in the solution of quantities of certain materials (principally monosodium phosphate) which will steadily increase as the process continues, so that the chemical composition of the solution, which may start out, for example, merely as a solution of acid zinc phosphate, will alter markedly with time. However, in spite of this alteration, its coating effect will remain substantially constant as long as the pH and the zinc content are maintained substantially unaltered and the solution is kept substantially free of iron.

Vapor Degreasing

As a specific example I will now describe my improved process as it may be applied to the coating of a succession of steel stampings such as automobile fenders, hood covers, splash guards, gasoline tank covers, etc.

The stampings, as they come from the press, are generally contaminated with oil, grease, and/or drawing compound, and sometimes with rust. Unless the rusting is severe, the parts may be satisfactorily coated without removal of the rust. If severely rusted, the parts may be subjected to pickling or other de-rusting treatment before entering the cleaning and coating system to be described.

Grease, etc., should be removed from the articles to be coated by my process. This may be accomplished by any of the well-known conventional means such as wiping or washing with a solvent, vapor degreasing, or alkaline cleaning.

Although my improved process of producing a uniform coating on a long series of surfaces is not dependent for its success on a particular type of cleaning procedure, yet the production of extremely uniform coatings on surfaces originally contaminated non-uniformly with grease, dirt, etc., is facilitated by a cleaning procedure that leaves the surfaces uniform with respect to residual contamination. This can be accomplished by solvent cleaning methods, but the simplicity and economy of alkaline cleaning makes this method preferable.

After being properly cleaned and prepared for the coating operation, the stampings are subjected to a coating solution such, for example, as the following:

Formula No. 1

Zinc oxide	pounds	1.667
Phosphoric acid, 75%	gallon	0.500
Water	gallon	0.500

The foregoing is a concentrated solution, and for use should be diluted with water until the concentration of the formula is about 2% by volume.

The diluted solution is placed in a suitable tank which is preferably equipped with means for controlling the temperature of the solution. As indicated above, the temperature may vary considerably, but I have found that a temperature in the neighborhood of 180° F. will produce excellent results.

Measured at room temperature, the above solution has an initial pH of about 2.5.

Inasmuch as I prefer to impinge the solution against the surface of the stampings, any suitable spraying equipment may be provided, the details of which are not illustrated, because they may take various forms, dependent upon individual requirements.

Circulation of the solution through the tanks to the spraying nozzles or jets is preferably provided for by means of a centrifugal pump, and the material which runs down from the work is collected in suitable troughs and returned to the tank or reservoir from which the solution is pumped.

The stampings to be coated are subjected to the impinging action of the jets of solution at a rate such as will provide for a treatment of from thirty seconds to one minute, although this period may vary considerably, depending upon conditions and the temperature of the solution.

While the stampings are being coated, the pumping system is kept in continuous operation in order to provide for continuous circulation of the solution from the tank to the impinging nozzles or jets, and from the jets to the work, and then back again to the tank.

Equipment of the kind described is familiar to those skilled in this art, but I should like to point out that a substantially continuously operating conveyor system of any suitable sort is particularly well adapted for use with my improved process, the stampings being carried past the impinging nozzles at a steady and uniform rate, and the coating action taking place in a remarkably short period of time.

As soon as the coating operation is begun, I immediately add to the solution regulated quantities of the solution of Formula No. 1, and also of a water solution of a salt of nitrous acid, preferably sodium nitrite. These additions are made preferably at a point where the solution is in more or less violent agitation so as to insure thorough mixing with the body of the solution.

The rate at which these solutions are introduced is regulated so as to maintain the zinc content and the pH of the coating solution substantially constant and also substantially freed of dissolved iron. To this end suitable determinations of the zinc content and of the pH may be made in any desired manner known to this art.

For example, the zinc content of the solution may be determined electrolytically or chemically. A convenient method consists in titrating a small sample of the solution with standard potassium ferrocyanide in accordance with the directions given in standard chemical text books.

The pH may be determined colorimetrically or potentiometrically by any standard method. The potential of the glass electrode vs. a saturated calomel electrode furnishes a convenient measure of the pH of the solution.

The zinc content of the solution may be varied over a considerable range without appreciably affecting the operation of the process, but for each zinc concentration there exists an optimum pH from which only narrow departures are allowable. The minimum pH (maximum hydrogen ion concentration) which is allowable to secure good coatings in the time allowable, varies a little with the type of metal to be coated, and the method of cleaning employed. The correct pH likewise varies with the temperature at which the coating solution is maintained.

Exact values of the pH at which the solution should be operated for each zinc concentration and temperature are difficult to specify. Typical values are given for several temperatures in Table 1, below. These values are for normally reactive steel, thoroughly alkali cleaned. A little experimentation will enable the operator to find the correct values for his conditions, and, once found, these need only to be maintained to insure perfectly uniform coating throughout.

TABLE No. 1

Typical pH values for various zinc concentrations and temperatures

Zinc concentration grams per liter	Temperature, °F.		
	170°	180°	190°
1	2.82	2.80	2.67
2	2.68	2.61	2.43
3	2.55	2.42	2.18
4	2.41	2.23	.....

The above values are average for successful operation on ordinary sheet steel, alkali cleaned.

Combines Cleaning into operation making it continous

Values more than 0.1 pH unit below these give definitely less satisfactory coatings; values more than 0.1 pH above this can only be maintained at the expense of excessive precipitation of zinc.

For solvent-cleaned steel values about 0.1 pH unit lower may be used to obtain excellent coatings. However, my experience has shown that a solution which operates perfectly with alkali-cleaned steel will likewise operate perfectly with solvent cleaned steel, if both are reasonably free of grease and uniformly cleaned.

After the stampings have been coated they may be washed and then dried, whereupon they are ready for the application of any desired finish, such as paint, varnish, lacquer, japan, or the like.

The zinc restoring solution may be the concentrated solution of Formula No. 1, and the sodium nitrite solution may contain about 60 grams of sodium nitrite per liter of water.

The addition of the solutions as described, so as to maintain the zinc content and the pH of the treating solution at substantially constant values, will, at the same time, serve to keep the solution substantially free of dissolved iron, the concentration of which latter should be kept below approximately 5 grams per liter. The use of the sodium nitrite solution described serves at the same time to insure the complete precipitation of the soluble iron, which is changed from the ferrous state to the ferric state, in which latter state it precipitates and can be removed from the solution from time to time.

The sodium nitrite solution mentioned above is only typical, and I wish it to be understood that solutions of any convenient strength may be employed, so long as they are added in proper quantities to accomplish the purpose in view.

Similarly, the zinc-containing solution used for maintaining the zinc concentration of the coating solution may likewise be varied considerably in composition and in concentration. It is convenient, however, to use the same solution as was originally used for making up the original coating solution.

Solutions of the phosphates of other coating metals except, of course, ferrous phosphate may be substituted for the zinc solution given in Formula No. 1, and by way of illustration the following may be employed:

Formula No. 2

Manganous carbonate	pounds	2.35
Phosphoric acid, 75%	gallon	0.500
Water	do	0.500

In using this solution in my improved process, the pH and the manganese content of the coating solution are maintained constant at appropriate values in a manner entirely analogous to the maintenance of the pH and the zinc content of the coating solution of the given example.

In any case, the content of coating metal in the working solution is determined by standard chemical methods forming no part of the present invention. Rapid methods of chemical analysis, such as titrations, are naturally to be preferred.

My improved process is capable of giving the finest-grained and smoothest coatings on surfaces which have been alkali-cleaned and rinsed, without drying, wiping, brushing or mechanical treatment either prior to or during the coating operation, which is a distinct and marked advantage over previous processes known to me, which, for the production of the smoothest coating, require that the work be solvent-cleaned and wiped or brushed before coating, or, at least, if it be alkali-cleaned, that it be dried and solvent-wiped before being coated, or that it be mechanically rubbed during the coating operation. This advantage makes it possible to combine the apparatus stages, in which the pre-cleaning is performed, into one continuous unit with the coating stage, which, of course, effects a corresponding saving in floor space and a marked economy in construction and equipment costs.

What I claim is:

1. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which comprises spraying a succession of pieces with a zinc phosphate solution; collecting the run-off for re-use in the spraying operation; and substantially continuously adding to the solution regulated quantities of zinc phosphate and of a soluble salt of nitrous acid sufficient to maintain the sprayed solution substantially constant as to zinc content and pH and also substantially free of dissolved iron.

2. The method of claim 1 wherein the solution is maintained at a substantially constant temperature within the range of approximately 160° F. to 190° F.

3. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which comprises spraying a succession of pieces with a zinc phosphate solution; collecting the run-off for re-use in the spraying operation; and substantially continuously adding to the solution regulated quantities of zinc phosphate solution and of an aqueous solution of sodium nitrite sufficient to maintain the sprayed solution substantially constant as to zinc content and pH and also substantially free of dissolved iron.

4. The method of claim 3 wherein the solution is maintained at a substantially constant temperature within the range of approximately 160° F. to 190° F.

5. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which includes spraying a succession of pieces with an aqueous acid phosphate coating solution which is substantially free of dissolved iron, collecting the run-off for re-use in the spraying operation, and substantially continuously adding to the solution regulated quantities of the acid phosphate and of a soluble salt of nitrous acid sufficient to maintain the sprayed solution substantially constant as to its metal content and pH and also substantially free of dissolved iron.

6. The method of claim 5 wherein the solution is maintained at substantially constant temperature within the range of approximately 160° F. to 190° F.

7. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which includes spraying a succession of pieces with an aqueous acid phosphate coating solution which is substantially free of dissolved iron, collecting the run-off for re-use in the spraying operation, and substantially continuously adding to the solution regulated quantities of aqueous acid phosphate coating solution and of a water solution of a salt of nitrous acid sufficient to maintain the sprayed solution substantially constant as to its metal content and pH and also substantially free of dissolved iron.

8. The method of claim 7 wherein the solution

is maintained at substantially constant temperature within the range of approximately 160° F. to 190° F.

9. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which comprises spraying a succession of pieces with a manganese phosphate solution; collecting the run-off for re-use in the spraying operation; and substantially continuously adding to the solution regulated quantities of manganese phosphate and of a soluble salt of nitrous acid sufficient to maintain the sprayed solution substantially constant as to manganese content and pH and also substantially free of dissolved iron.

10. The method of claim 9 wherein the solution is maintained at a substantially constant temperature within the range of approximately 160° F. to 190° F.

11. In the art of coating ferrous metal surfaces with a water insoluble metallic phosphate, the substantially continuously operable method which comprises spraying a succession of pieces with a manganese phosphate solution; collecting the run-off for re-use in the spraying operation, and substantially continuously adding to the solution regulated quantities of manganese phosphate solution and of an aqueous solution of sodium nitrite sufficient to maintain the sprayed solution substantially constant as to manganese content and pH and also substantially free of dissolved iron.

12. The method of claim 11 wherein the solution is maintained at a substantially constant temperature within the range of approximately 160° F. to 190° F.

GERALD C. ROMIG.

CERTIFICATE OF CORRECTION.

Patent No. 2,132,883. October 11, 1938.

GERALD C. ROMIG.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 24, for "freed" read free; page 4, first column, line 27, for "5" read .5; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of December, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.

PA Summary

DoD Site #
55
Area: I

☐ **NDAI** ☑ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	1876	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	8925

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Blacksmith Shop/Machine/Welding Shops

Secondary DoD Uses
Machine Shop/Welding Shop

Post-Army Uses
Retail Formica counter top fabricators. 1971-75: Laminations Unlimited for Formica counter top lamination. Currently used as a machine and welding shop for Unico, Inc.

Flooring
Concrete

Disposal Information
None Listed

Activities (inside/outside)
Inside

Records Research Report Addenda Data
SERVICE SHOPS: Blacksmith: gas forge (2), 51 kW furnace (2), 200 ton hydraulic press, 285 ton hydraulic press, 3 quench tanks, metal shop and welding. Records indicate that Building 55 suffered a great deal of structural damage from a fire in 1883. In the late 1940's and early 1950's, a structural addition of Building 55A was identified which housed a Machine shop and a Welding Shop. Drawing 5354, dated 1952, identifies a sprinkler system and the Welding Shop. Drawing 5353 shows a tunnel below the Welding shop and adjacent to the storeroom.

Records Research Report Comments
The tunnel systems below Building 55 runs the length of the building and was slated for a sprinkler system. Records do not give a clear indication of the tunnels purpose.

ENVIRONMENTAL SUMMARY

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 1	AST or UST?	US Army	0	Unknown	Water	Pre-1957	Unknown	Unknown	☐
Uses:	Quench Tank								
Comments:	Pre-1957 based on Reference 714, Equipment list for new facility.								
Vessel # 2	AST or UST?	US Army	0	Unknown	Water	Pre-1957	Unknown	Unknown	☐
Uses:	Quench Tank								
Comments:	Pre-1957 based on Reference 714, Equipment list for new facility.								

PA Summary

DoD Site #
55
Area: I

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 3	AST or UST?	US Army	0	Unknown	Water	Pre-1957	Unknown	Unknown	☐

Uses: Quench Tank

Comments: Pre-1957 based on Reference 714, Equipment list for new facility.

Furthest Stage of Environmental Investigation

SI

COMMENTS

Since the Records Research Report, the use of the tunnel beneath Building 55 is access for utilities. Building suffered structural damage from fire. Building 55 is part of the 50 Series Complex. In 1999, USACE detected two magnetic anomalies (designated "D" & "E") during a geophysical survey in the breezeway between Bldg 55, Bldg 56C, and Bldg 56A. Anomaly "D" is suspected to be a concrete slab or possible cistern while "E" is suspected to be a large utility or a small UST. Two hand auger borings were added to the sampling program to investigate these anomalies (ref 1207). Sampling for metals and fuels suspected associated with 2 forges planned. Additional COPCs include Cr(VI), Hg, PCBs, & PAHs (ref 1099). Analytical results from soil samples collected beneath Building 55 indicated releases to the subsurface of lead, solvents, and fuels. The source of the solvents (in the form of TCE) and fuels (in the form of PAHs) in soil is not known. These detections were not expected based on usage. Groundwater south of Building 55 is impacted with fuels and solvents. The source of fuels in groundwater may be related to the fuels reported in groundwater north of the 50 Series Complex (ref 1207).

RECOMMENDATIONS

Additional investigation is required at this site based on the 1999 investigation. Additional sampling is recommended to determine the lateral extent of fuels and solvents in groundwater downgradient of this building (and complex).

PA Summary

DoD Site #
55A
Area: I

☑ **NDAI** ☐ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	1940s - 1950s	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	3277

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Welding Shop/Machine Shop

Secondary DoD Uses
None Listed

Post-Army Uses
Unico machine shop and storage

Flooring
Concrete

Disposal Information
None Listed

Activities (inside/outside)
Inside

Records Research Report Addenda Data
None Listed

Records Research Report Comments
This was an addition to Building 55 completed in the late 40s or early 50s.

ENVIRONMENTAL SUMMARY

Furthest Stage of Environmental Investigation
NONE

COMMENTS

There are no records indicating any potential environmental concerns related to DoD activities at this building.

RECOMMENDATIONS

No DoD action is indicated (NDAI) for this site.

PA Summary

DoD Site #
56
Area: I

☐ **NDAI** ☑ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	1884	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	36140

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Leather & Canvas Shop/Welding Shop

Secondary DoD Uses
Unknown

Post-Army Uses
Warehousing, automotive parts and rebuilt transmissions for Standard Transmissions in 1973. Service and repair of industrial machinery for Unico Industrial Service and Engineering Co from 1971 to 1977 (ref 702). Exxon Co. in 1977 for storage. Currently a wallpaper manufacturer occupies the 2nd floor.

Flooring
Concrete and Wood

Disposal Information
Unknown

Activities (inside/outside)
Inside

Records Research Report Addenda Data
Leather and Canvas 1962 vacate date (ref 613). Leased 41,280 sq ft to Unico Industrial Service. A gas boiler was installed in the facility in 1945. During the latter half of 1950, four new firing pits were put into operation. In June 1951, Building 56 housed the Welding Shop, the Canvas and Leather Goods Shop, and the small arms rebuild program. In 1951, the Machine Tool Rebuild division was established, along with the conversion of the small arms buffing room to a motor rebuild room. Brown and Caldwell identified in 1952, operations in Building 56 included painting only and indicated that there were sewer system deficiencies in the area of Buildings 56, 57, 89, and 161 which frequently needed rodding to keep the sewage lines open. These deficiencies were likely due to the settling of the former marshland in which these lines were installed. Surface Preparation Room: Sandblast Barrel Tumblers (2) (ref 714).

Records Research Report Comments
Former welding and machine shop. Housed Rubber Mold Dept. on 2nd floor. In 1907, a total of 1,927 rounds of fixed ammunition was disassembled and reloaded in this building. Boilers 1 and 2 used heavy #5 oil that was delivered hot. Gas boilers installed. According to instructions issued by the Rock Island Arsenal in 1910, the proper solution for removing metallic residue from the bores of small arms consisted of one ounce of ammonium per sulfate, 200 grains of ammonium carbonate, 6 ounces of ammonia (28 percent), and 4 ounces of water. In 1951 a hoist and monorail in the Parkerizing room for dipping rifles into oil dip tanks, renovation of the Leather shop boiler and oil tank on the oil tank burner occurred. In December 1960, rusted pipes were replaced with heavy-gauge pipe, coated with Gila coat for protection against acid fumes from the exhaust system, which had caused the deterioration.

PA Summary

DoD Site #
56
Area: I

ENVIRONMENTAL SUMMARY

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 1	UST	US Army	0	Concrete	Caustics	Unknown	Unknown	Unknown	☐
Uses:	Dip Tank								
Comments:	Tank used for parkerizing. Tank still exists. Emptied by current landowner (at the time contained caustics).								
Vessel # 2	ASTs	US Army	0	Unknown	Oil	Pre-1951	Unknown	Unknown	☐
Uses:	Dip Tanks								
Comments:	Unknown how many dip tanks were located in Building 56. Pre-1951 based on Reference 197 Memo on Expansion and Rehabilitation of Building 56.								

Furthest Stage of Environmental Investigation

SI

COMMENTS

This building is part of the 50 Series Complex. Preservation of small arms was performed in this building for decades. In 1999, a preliminary site investigation was conducted by USACE. Soil and groundwater samples were collected within and around the building. In particular in areas at the suspected parkerizing/oakite dip tank (no solvents used in the parkerizing or preserving process). Lead was detected in the soil. TCE, acetone, chloroform, and cis-1,2-DCE were the predominant VOC compounds detected in soil. Motor oil was found above the MDL in soil. PAHs, phenanthrene and pyrene, were detected in soil. VOCs were also detected in groundwater. (ref 1074). The presence of VOCs in soil and groundwater may be associated with a post-Army release.

RECOMMENDATIONS

Additional investigation is recommended to determine the lateral extent of fuels and solvents in groundwater downgradient of the building (and complex).

Page: Y

Author: RPotter
Subject: Note
Date: 4/12/2006 10:57:51 AM
Not true. Solvent was used in Parkerizing room.

Author: RPotter
Subject: Highlight
Date: 4/12/2006 11:23:15 AM
How do you work with a tank that is 7 feet tall. Would it be in the ground? I think so. How come there are 8 parkerizing tanks? Do they all do the same thing? Or are they caustic, rinse, acid, pickle, oil, rinse, etc. A 7' tall tank is the exact same size as the tank used in building 165 for TCE vapor degreasing. The Drawing is reference # 613 in the RRR. In addition the U shaped cement pit with blocks for the feet of equipment and an overhead monorail are the same as "57". The exhaust system can be seen in a picture of building 57A in the RRR as reference# ?

PA Summary

DoD Site #
56A
Area: I

☐ **NDAI** ☑ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	1944	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	51770

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Small Arms Shop/Leather Canvas Shop

Secondary DoD Uses
None Listed

Post-Army Uses
Unico Industrial Service and Engineering Co. 1972-1975 for the servicing and repair of industrial machinery (ref 587). Metropolitan Van and Storage in 1975 for the storage of household goods (ref 587). Exxon Co. in 1977 for storage (ref 702). Currently houses a beauty shop and several artists studios. Portions of the building are used for storage.

Flooring
Concrete

Disposal Information
None Listed

Activities (inside/outside)
Inside

Records Research Report Addenda Data
Leather and Canvas shop vacated in 1962, Small Arms section vacated in 1964 (ref 713). Small Arms section included a parkerizing room (Building 57) and parkerizing tanks. Building 56A was added to the facility in 1944 as the Small Arms shop. Record research was not clear on how many parkerizing tanks were inside building. According to a progress of operations document for 1952 a continuous degreaser was installed for the small arms branch presumably in Building 56A (a continuous degreaser was also associated with Building 57). Drawing 5352 dated 5 August 1952 identifies two test fire rooms in the basement on the southern side. Also identified are a firing room, ammunition storage room, and the boiler room (ref 345). Drawing 1479 showed the plans for fuel storage installation - one 10,000-gallon high octane gasoline tank and one 1,000-gallon diesel oil tank located west of Building 53 (ref 390) (which is now beneath Building 56A). Surface Preparation Room: Degreaser 10'x39"x7', Degreaser Still. Parkerizing Room: Parker Tanks 4'x8'x4' (8), Parker Tank 4'x6'x4' (ref 714).

Records Research Report Comments
Basement and first floor were small arms repair, and the third floor was leather and canvas shop. According to a Brown and Caldwell 1952 Survey, operations included degreasing, dipping and preserving (ref 405).

ENVIRONMENTAL SUMMARY

Vessel Inventory

Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army

PA Summary

DoD Site #
56A
Area: I

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 1	ASTs	US Army	0	Unknown	Unknown	Unknown	Unknown	Unknown	☐
Uses: Dip Tanks									
Comments: Unknown how many dip tanks were located in Building 56A.									
Vessel # 2	UST	US Army	1000	Unknown	Diesel	Unknown	Pre 1944	No	☐
Uses: Fuel Storage									
Comments: Presumed location beneath the southeast corner of Building 56A. Could not confirm location in 1999 investigation (BC Ref BC 1207). If installed, likely removed prior to construction of Building 56A in 1944.									
Vessel # 3	UST	US Army	10000	Unknown	High Octane Gasoline Tank	Unknown	Pre 1944	No	☐
Uses: Fuel Storage									
Comments: Presumed location beneath the southeast corner of Building 56A. Could not confirm location in 1999 investigation (BC Ref BC 1207). If installed, likely removed prior to construction of Building 56A in 1944.									
Vessel # 4	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 5	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 6	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 7	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 8	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 9	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 10	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 11	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									
Vessel # 12	AST	US Army	0	Unknown	Caustics	Pre-1957	Unknown	Unknown	☐
Uses: Parker Tank									
Comments: Pre-1957 based on Reference 714, Equipment list for new facility.									

PA Summary

DoD Site #

56A

Area: I

Furthest Stage of Environmental Investigation

SI

COMMENTS

In 1999, USACE conducted a geophysical survey to assess the presence of a suspected 1,000-gal diesel UST and a 10,000-gal gasoline UST and associated piping, reportedly installed as part of the Bldg 53 fueling system beneath the southwest corner of Building 56A. Geophysical survey was inconclusive; two borings were placed on east and west sides of Building 56A. There appears to be no release of PCBs, hydrocarbons, or metals from former equipment in the transformer room (Building 56A). No further action under FUDS is recommended to address the Building 56A transformer room (ref 1207). The equipment room of Building 56A requires further investigation. Solvents and fuel were identified in groundwater along the south side of the building (in the downgradient direction of the 50 Series Complex and the building).

RECOMMENDATIONS

Additional investigation is recommended to determine the lateral extent of fuels and solvents in groundwater downgradient of the building (and complex).

PA Summary

DoD Site #
56B
Area: I

☑ **NDAI** ☐ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	Late 1940s	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	4576

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Welding Shop and possible foundry

Secondary DoD Uses
None Listed

Post-Army Uses
Bldg 56B leased to George McKeever for glass product manufacturing from 1965-75 (ref 587). In 1999, the tenant did woodworking. The building contained piles of scrap wood used to cut out plaques and other types of decorative shapes. The building contained two areas for painting. Currently, the building is vacant.

Flooring
Concrete

Disposal Information
None Listed

Activities (inside/outside)
Inside

Records Research Report Addenda Data
None Listed

Records Research Report Comments
Records Research does not specifically mention this building. Parkerizing activities may have been performed in this building. The building was a welding shop until the deactivation of the Arsenal in 1964.

ENVIRONMENTAL SUMMARY

Furthest Stage of Environmental Investigation
SI

COMMENTS

This building is part of the 50 Series Complex. In 1999, USACE conducted a soil investigation. Three borings were drilled through the concrete floor. Soil samples were collected from each boring to a maximum depth of 5 feet. Soil samples were analyzed for metals, fuels and solvents. No significant impacts to soil were reported. (ref 1207).

RECOMMENDATIONS

No further action under FUDS is recommended for this building.

PA Summary

DoD Site #
56C
Area: I

☑ **NDAI** ☐ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	Late 1800s	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	977

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Storehouses and Warehouses

DoD Uses
Storage

Secondary DoD Uses
None Listed

Post-Army Uses
Storage

Flooring
Concrete

Disposal Information
None Listed

Activities (inside/outside)
Inside

Records Research Report Addenda Data
None Listed

Records Research Report Comments
Records Research does not specifically mention this building.

ENVIRONMENTAL SUMMARY

Furthest Stage of Environmental Investigation
NONE

COMMENTS

This building has been always associated with storage. It is also a pass through from Building 55 to Building 56. In 1999, USACE researched this building because it is part of the 50 Series Complex and determined there were no records indicating any potential environmental concerns related to DoD activities at this site.

RECOMMENDATIONS

No DoD action is indicated (NDAI) for this site.

PA Summary

DoD Site #
57
Area: I

☐ **NDAI** ☑ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	1877	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	11550

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Small Arms Shop, Firing Range

Secondary DoD Uses
Firing Range

Post-Army Uses
Currently houses artist studios

Flooring
Wood

Disposal Information
According to Mr. Byerrum, chemicals would go down a drain in to two large cisterns and when the cisterns became full, the contents was pumped directly into the Carquinez Strait. Mr. Byerrum also stated, Industrial Waste was pumped into a swamp west of the building.

Activities (inside/outside)
Inside

Records Research Report Addenda Data
SMALL ARMS: Teardown Room: degreaser (3'x5'), degreaser still, five gun capacity electric barrel cleaner (2), Dip Tank (2) (ref 714). No records prior to 1945. Drawing 2994A, dated 26 September 1945, identifies the cleaning room and also identifies the locations of the cleaning solution vats (ref 634). In 1952, Brown and Caldwell reports the only hazardous waste-producing operation in Building 57 at this time was degreasing (ref 405).

Records Research Report Comments
Former carpenter shop, three (3) test firing ranges in basement. A 1952 report indicated that there were sewer system deficiencies in the area of Buildings 56, 57, 89, and 161 which frequently needed rodding to keep the sewage lines open. These deficiencies were likely due to the settling of the former marshland in which these lines were installed. According to Mr. Byerrum, a former Arsenal employee, the degreasing process included TCE heated by steam coils until the TCE would vaporize, the small arms were hung over the TCE tanks and the chemical vapors would degrease them. The cold water coils cooled the boiling chemical to prevent the bath from spilling over the sides. He said that it would often boil over the sides and spill down the drain (ref 566).
In earlier years before the installation of the degreaser when acids and caustics were used for degreasing of small arms, the drains emptied into two large cisterns located outside the building (cistern locations unknown). When the cisterns became full, the contents were dumped directly into the Carquinez Strait or dumped daily into the swamp west of the building (Byerrum, 1997) prior to filling of the area with artificial fill around 1920. Based on the processes occurring in the industrial area prior to 1920, it appears that any used material dumped into the former marshland would have been acids and possibly oils. It is not clear where the contents of the solvent-based materials in the degreaser tanks or other used materials were disposed of; however, it is presumed to be storm drains and the sanitary sewer system.

PA Summary

DoD Site #
57
Area: I

ENVIRONMENTAL SUMMARY

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 1	Cistern	US Army	0	Unknown	Water (primary)	Unknown	Unknown	No	☐
Uses:	Emergency storage for fire. Possible disposal area for spent solvents								
Comments:	Degreasing solution was drained into large cisterns, located underground which were emptied into the Carquinez Strait when full. Could not find in 1999 geophysical survey (BC Ref 1207).								
Vessel # 2	Cistern	US Army	0	Unknown	Water (primary)	Unknown	Unknown	No	☐
Uses:	Emergency storage for fire. Possible disposal area for spent solvents								
Comments:	Degreasing solution was drained into large cisterns, located underground which were emptied into the Carquinez Strait when full. Could not find in 1999 geophysical survey (BC Ref 1207).								
Vessel # 3	AST	US Army	0	Unknown	Solvents	Unknown	Unknown	Unknown	☐
Uses:	Degreaser Dip Tank								
Comments:	Tank removed								
Vessel # 4	AST	US Army	0	Unknown	Unknown	Pre-1957	Unknown	Unknown	☐
Uses:	Dip Tank								
Comments:	Reference 714 lists 2 dip tanks at Building 57.								
Vessel # 5	AST	US Army	0	Unknown	Unknown	Pre-1957	Unknown	Unknown	☐
Uses:	Dip Tank								
Comments:	Reference 714 lists 2 dip tanks at Building 57.								

Furthest Stage of Environmental Investigation

SI

COMMENTS

This building is part of the 50 Series Complex. The main features of this building include a degreaser in Building 57, and three firing ranges in the basement of Building 57. Samples were collected from the target material in the firing ranges. The samples contained elevated concentrations of lead, copper, and antimony . Recommendations from the 1999 investigation included additional investigation in regards to the solvents found in the soil and water and removal and offsite disposal of firing range target material from the basement of Bldg 57 (ref 1207). The Records Research information also indicated there were sewer system deficiencies.

RECOMMENDATIONS

Additional investigation is recommended to determine the lateral extent of fuels and solvents in groundwater downgradient of the building (and complex).

PA Summary

DoD Site #
57A
Area: I

☑ **NDAI** ☐ **FAR** ☐ **IRR** ☐ **Potential OE**

SITE DESCRIPTION

Parcel # (APN)	Owner Name	Site Address
0080-280-030	HISTORIC ARSENAL PARK LTD	900 JACKSON STREET

Year Bldg. Built	Late 1940s	**Year Bldg. Removed**	Not applicable	**Site Area (SqFt)**	4123

Current Land Use Mixed Use-Lower Arsenal

OPERATIONAL HISTORY

DoD Use Type
Industrial/Manufacturing Shops

DoD Uses
Small Arms Shop

Secondary DoD Uses
Parkerizing Room

Post-Army Uses
Warehousing, automotive parts and rebuild transmissions for Standard Transmissions (North American Wieblpfeltzer, Inc.). 1973.

Flooring
Concrete

Disposal Information
None listed

Activities (inside/outside)
Inside and outside

Records Research Report Addenda Data
Soil samples taken during the 1994 investigation (by current landowner) found TCE in soil at 2 feet and additional contaminants were identified in deeper samples.

Records Research Report Comments
Building 57 was the former "Parkerizing Room".

ENVIRONMENTAL SUMMARY

Vessel Inventory

	Type	Original Owner	Size (Gal.)	Construction	Commodity Stored	Date Installed	Date Removed	Post-Army	Installed Post-Army
Vessel # 1	UST	US Army	0	Concrete	Acids	Late 1940s	Present	Yes	☐

Uses: Dip Tank

Comments: Vat exists but filled with gravel and topped to grade with concrete. A previous tenant in the 1970s used the vat to dispose of transmission parts (FA/BC Ref 1207).

Furthest Stage of Environmental Investigation
SI

COMMENTS

This building is part of the 50 Series Complex. 1994 sampling found TCE soil contamination in the area of the parkerizing vat in Building 57A. In 1999, the USACE conducted geophysical surveys to determine if a U-shaped vat still exists and to determine

CONFIDENTIAL

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SEPTEMBER 7, 1994

MARK POLLOCK
ATTORNEY AT LAW
1207 COOMBS STREET
NAPA, CALIFORNIA 94559

ATTORNEY/CLIENT PRIVILEGE
WORK PRODUCT

RE: MATTER OF: UNICO

SUBJECT: INTERVIEW OF FORMER BENICIA ARSENAL EMPLOYEE

PERSON INTERVIEWED: BUSTER BYRON
283 EAST "J" STREET
BENICIA, CALIFORNIA
(707) 745-6210

DATE, TIME AND LOCATION OF INTERVIEW: 8-31-94, ABOUT NOON
283 EAST "J" STREET
BENICIA, CALIFORNIA

ON THE ABOVE DATE AND TIME I INTERVIEWED MR. BUSTER BYRON. A SUMMARY OF THE INTERVIEW FOLLOWS:

MR. BYRON IS A FORMER EMPLOYEE OF THE BENICIA ARSENAL.

HE BECAME EMPLOYED AT THE ARSENAL IN 1938 OR 1939.

HE WORKED THERE FOR A FEW MONTHS AND THEN SERVED THREE YEARS IN THE U.S. COAST GUARD.

DURING HIS TERM WITH THE U.S. COAST GUARD HE WAS STATIONED AT THE BENICIA ARSENAL FOR ABOUT 18 MONTHS.

AFTER HIS TERM WITH THE U.S. COAST GUARD HE WENT BACK TO WORK AT THE BENICIA ARSENAL IN THE SMALL ARMS DIVISION. (1941 OR 1942).

I SHOWED MR. BYRON PHOTOS OF THE BUILDINGS THAT WERE KNOWN AS 56 AND 57 THAT DEPICT THE ANNEX BETWEEN THE TWO BUILDINGS.

HE IDENTIFIED THE ANNEX AS A BUILDING THAT WAS USED FOR DEGREASING AND PARKERIZING SMALL ARMS.

HE BELIEVES THE ANNEX WAS BUILT DURING WW II MAYBE ABOUT 1943.

HE WORKED IN THE SMALL ARMS DIVISION FOR 11 YEARS AND THEN WAS PROMOTED TO GENERAL FOREMAN IN THE PRESERVATION, PACKAGING AND STORAGE INSPECTION DIVISION. HE REMAINED IN THIS POSITION UNTIL 1962 WHEN HE TOOK A U.S. GOVERNMENT EMPLOYEE POSITION AT "AEROJET".

I SHOWED HIM A PHOTO OF THE INTERIOR OF THE ANNEX BUILDING THAT DEPICTS THE CONCRETE VESSEL THAT IS THE SUBJECT OF THIS INVESTIGATION.

HE TOLD ME THAT THE VESSEL WAS USED FOR DEGREASING SMALL ARMS AND THAT THE ROOM WAS DESIGNATED AS THE WORK AREA FOR DEGREASING, PARKERIZING AND BLUING OF SMALL ARMS, MOSTLY 50 CAL. MACHINE GUNS.

I ASKED HIM IF HE RECALLED ANY OF THE CHEMICALS THAT WERE USED IN THE PROCESSING OF THE SMALL ARMS. HE TOLD ME THAT TRI-CHLORIDE-ETHYLENE OR TRI-ETHYLENE-CHLORIDE, PHOSPHORIC ACID, OAKITE (A BLUING COMPOUND), A LIGHT OIL P-20, AND STODDARD (SP. ?) SOLVENT (A PAINT THINNER) WERE USED. THERE MAY OF BEEN MORE BUT IT HAS BEEN A LONG TIME AND HE DOES NOT RECALL.

HE RECALLS THAT THE TRI-CHLORIDE-ETHYLENE WAS USED IN THE DEGREASING PROCESS. THE DEGREASING TANKS WERE ON THE FLOOR AND THEY HAD HEATING COILS INSIDE THEM, THEY WERE HEATED BY STEAM. NEAR THE TOPS OF THE INSIDE OF THE TANKS THERE WERE COLD WATER COILS. THE TRI-CHLORIDE-ETHYLENE WAS HEATED BY THE STEAM COILS TO THE POINT THAT THE CHEMICAL WOULD VAPORIZE, THE SMALL ARMS WERE HUNG OVER THE TANKS AND THE CHEMICAL VAPORS WOULD DEGREASE THEM. THE COLD WATER COILS WERE TO COOL THE BOILING CHEMICAL TO PREVENT THE CHEMICAL FROM BOILING OVER THE SIDES. THIS DID NOT ALWAYS WORK AND THE CHEMICAL WOULD BOIL OVER AND SPILL ON THE FLOOR. THE SPILLS WOULD FLOW INTO DRAINS.

IN THE EARLY YEARS THAT HE WORKED IN THE SMALL ARMS DIVISION HE RECALLED THAT THE DRAINS DRAINED INTO TWO LARGE BRICK LINED CISTERNS THAT WERE LOCATED UNDERGROUND OUTSIDE THE BUILDING.

WHEN THE CISTERNS WERE FULL, HOSES AND PUMPS WERE USED TO PUMP THE CONTENTS INTO THE CARQUINEZ STRAITS. LATER A DRAINAGE SYSTEM WAS INSTALLED AND HE BELIEVES THAT IT DRAINED INTO THE CARQUINEZ STRAIGHTS.

INVESTIGATION CONTINUES AND WILL BE THE SUBJECT OF ADDITIONAL REPORTS.

Patrick J. McGreal

PATRICK J. McGREAL
PRIVATE INVESTIGATOR

products (refs 418 and 587); Standard Transmissions in 1973 for the storage of automobile parts and the rebuilding of transmissions (ref 418); and Unico Industrial Service and Engineering Co. from 1971 to 1977 for the servicing and repair of industrial machinery (refs 418, 586, and 587).

Records research has identified the following post closure uses and corresponding occupancy dates for Building 56A: Unico Industrial Service and Engineering Co. from 1972 to 1975 for the servicing and repair of industrial machinery (ref 587); Metropolitan Van and Storage in 1975 for the storage of household goods (ref 587); and Exxon Co. in 1977 for storage (ref 702).

Buildings 56 and 56A remain and are owned by Gordon Potter. Building 56 houses a wallpaper manufacturer on the second floor. Building 56A houses a beauty shop and several artist's' studios. Portions of the building are used for storage.

Building 57 Small Arms Shop/Firing Range

Constructed in 1877 of locally quarried sandstone, Building 57 originally housed the Carpenter Shop. New carpentry facilities were constructed near Bottle Hill (to the southwest) beginning in 1943, and it is presumed that the Carpenter Shop moved at that time. No records were located to describe operations in Building 57 prior to 1945; it could have transitioned to Small Arms Shop at any time during that period.

Drawing 2994A, dated 26 September 1945, identifies the cleaning room and also identifies the locations of the cleaning solution vats (ref 634).

According to the 1952 survey report by Brown and Caldwell, the only hazardous waste-producing operation in Building 57 at this time was degreasing (ref 405) (Appendix D). Building 57 was investigated in 1994 by its present owner, Mr. Gordon Potter, as part of a bank loan submittal. During the investigation, Mr. Buster Byerrum (Arsenal employee from the late 1930s to 1962) was interviewed. He identified Building 57A as the annex used for the degreasing and parkerizing of small arms. Mr. Byerrum, who worked in the Arsenal's Small Arms Division for 11 years, reported that a concrete vessel housed within Building 57 was used for degreasing small arms, and that the room was

1esignated as the "work area for degreasing, parkerizing, and bluing of small arms, mostly 50 caliber machine guns." This vessel was the subject of the 1994 investigation (ref 566).

Mr. Byerrum reported that the chemicals used for the processing of the small arms were trichloroethylene (TCE), phosphoric acid, Oakite (bluing compound), light oil P-20, and Stoddard solvent. He stated that the degreasing tanks were "on the floor and they had heating coils inside them, which were heated by steam. Near the tops of the inside of the tanks there were cold water coils. The TCE was heated by the steam coils to the point that the chemical would vaporize, the small arms were hung over the tanks and the chemical vapors would degrease them. The cold water coils were to cool the boiling chemical to prevent the chemical from boiling over the sides." He said that very often the chemical would boil over and spill on the floor, and then flow into the drains (ref 566).

In the earlier years, the drains emptied into two large brick-lined cisterns located underground outside of the building (cistern locations unknown). When the cisterns became full, the contents were pumped directly into the Carquinez Strait. On a recent interview for this records search, Mr. Byerrum also stated that industrial waste from Building 57 was dumped daily into the swamp west of the building (Byerrum, 1997).

As part of the 1994 investigation, soil samples were submitted from various depths and locations in the vicinity of the former concrete tank for analysis. Test results from the field investigation first identified TCE at a depth of 2 feet. Additional contaminants were identified in deeper samples. For sampling location detail refer to Figure 1, Site Plot Plan/Borehole Locations, Attachment A, included in the Meredith/Boli & Associates, Inc. (ref 566) (Attachment 9A and 9B).

Table 2.2.c summarizes the results from American Environmental Testing Laboratory, Inc., submitted to Gordon Potter.

Table 2.2.c
Chemicals Identified at Building 57A to Date*

Medium	Chemicals Reported	Concentration Range
Soil	Arsenic	<0.5-2.5 mg/kg

Office of the Post Engineer, Benicia Arsenal, California. (*ref 652*). 1920. Infirmary (8 Bed). Record Group 92. Archive II, College Park, Maryland. March.

Ordnance Office War Department. *(ref 653). 1894.* Map of Benicia Arsenal Barracks Reservation. Class 19, Division 12, Drawing No. 3. Archive II, College Park, Maryland. May 1.

Ordnance Office War Department. *(ref 654*). 1894. Map of Benicia Arsenal Reservation.

Engineers Office Headquarters Military Division – Pacific 6, Department of California, San Francisco, California. *(ref 662*). 1877. Skeleton Map of U. S. Military Reserve, Benicia Barracks, CA. File 1021. USACE, St. Louis, Missouri. November 21.

U.S. Engineer Office, San Francisco, California. *(ref 664).* 1944. Topography for Firing Range, Sheet No. 2. File No. 56 Division 1. USACE, St. Louis, Missouri. December 5.

3.3 PERSONAL INTERVIEWS

Allenwood, Bob (former Arsenal employee). 1997. Conversation Regarding Former Arsenal Fire Department Practices. 9 December.

Allenwood, Bob (former Arsenal employee, Assistant Fire Chief). 1997. Conversation Regarding Former Benicia Arsenal Practices. 25 November.

Bailey, Leroy (former Arsenal employee). 1998. Conversation Regarding Former Arsenal Practices. 4 February.

Bailey Leroy (former Arsenal employee, Surveillance). 1997. Conversation Regarding Former Surveillance Practices at the Arsenal. 25 November.

1 yerrum, Buster (former Arsenal employee). 1997. Conversations Regarding Former Arsenal Practices. 25 November.

2 yerrum, Buster (former Arsenal employee). 1998. Conversations Regarding Former Arsenal Practices. 22 September.

Champagne, Lee Roy (Benicia citizen and artist). 1997. Conversation Regarding His Residence Property. 13 November.

Clyma, Delmar (former Arsenal employee). 1997. Conversation Regarding Former Arsenal Practices in Storage Area. 14 November.

Clyma, Delmar (former Arsenal employee). 1997. Conversation Regarding Former Arsenal Practices in Storage Area. 19 November.

Erck, Lewis (former Arsenal employee). 1997. Conversation Regarding Former Arsenal Practices. 10 December.

1 Bridge?

2 MS. LINCK: Benicia.

3 MS. BARDET: Okay, Benicia Bridge.

4 MS. LINCK: Right. So, you know, the bedrock

5 here (drawing) -- something like that approximately.

6 And it may -- and this distance here in some cases is

7 probably in contact with some of the subsurface

8 features. So we got the basement in here, right? And

9 the firing range -- if anybody has ever seen the firing

10 ranges in the basement area, they're sittin' right in

11 here.

12 MR. MITCHENER: Did they -- they excavated into

13 that.

14 MR. WEBB: Yes. Right. So you got -- you got

15 the firing ranges here, in there, and then the feature

16 that was most likely -- the water just caused -- is the

17 trough, the trough that's in that one -- in that one

18 building. And that has a large tank that was part of it

19 where they would dip the arms in, right, and then

20 they'd -- they'd dip 'em in here, and then they'd be in

21 a trough.

22 MR. MITCHENER: Wendy, what was that made out

23 of?

24 MS. LINCK: Concrete. That's the vat. So this

25 is where TCE was -- resided. Most likely, you know, it

Summary of Comments on Combined Minutes 01-march05.pdf

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 3:45:29 PM
RAB BOARD MEETING 1/15/03 Mr. Webb

Sequence number: 2
Author: rpotter
Subject: Highlight
Date: 4/19/2006 3:45:49 PM
RAB BOARD MEETING 1/15/03 Wendy Linck.

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1 1as filled up to there.

2 MR. CROSS: TCE? What is that?

3 MR. MITCHENER: Trichloroethylene. It's an

4 industrial solvent.

5 MS. LINCK: And then the arms would just hang,

6 and then they'd drip, and the drippings would drip,

7 drip, drip back, you know, that kind of thing.

8 So if -- so here you've got this complex that

9 happens to be on this -- probably this sandstone right

10 here, which has preferential bedding planes in it. Like

11 if you're up by Jefferson Street daycare, those real

12 steep bedding planes, well, that's why this drops off,

13 and probably drops off very -- in the same direction.

14 Then you added the swamp, the old swamp, and there's --

15 MR. MITCHENER: I have your figure that shows

16 the old swamps drawn very nicely too. Some great

17 figures.

18 MS. LINCK: So this is -- this is what we call

19 a conceptual site model by adding all these pieces

20 together. So you add the swamp in there, and you've got

21 all this clay that's settin' in here, like that. So

22 you've got all this clay sitting in here, and it's

23 all -- you know, the old Building 71, you know, they had

24 a hard time keeping the foundation -- it was over in

25 this area -- 'cause the bay muds, you know, it wouldn't

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 3:46:14 PM
RAB BOARD MEETING 1/15/03 Wendy Linck.

1 focus at the complex was small arms repair,
2 preservation, during the entire inception that was
3 happening in four different buildings at that time, and
4 in order to do that process, they had acid baths being
5 used in order to clean small arms to get the old paint
6 off, the old oil and grease or whatever off of there.
7 They were using a parkerizing process in regards -- in
8 that area, and parkerizing is just a term being used to
9 clean small arms using a process of -- later on --
10 earlier on was probably with a Stoddard solvent. Later
11 on it's TCE or chlorinated solvents was much more
12 readily available. That was the primary solvent of use
13 at that time. And parkerizing is just that cleaning
14 process and -- and restoring the gun or whatever metal
15 back to its ready wear condition, usually using some
16 kind of bluing compound and a light oil in order for
17 preservation. There's also some white leads and grease,
18 other greases that were used in -- during this small
19 arms repair.
20 In the other buildings, as we talked about,
21 there was machining and welding happening, pretty much
22 over in the right-hand portion of the -- the arsenal as
23 we look at it up on the screen. A foundry was located
24 in Building 55. They were manufacturing projectiles in
25 that building.

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 2:06:34 PM

Sequence number: 2
Author: rpotter
Subject: Note
Date: 4/19/2006 2:30:27 PM
RAB BOARD MEETING 3/19/03 Wendy Linck. States that parkerizing uses solvent and TCE

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we -- we know that the -- the 50 Series Complex was -- some on an elevated hill of some sort, so it was naturally to -- assume it was probably on some kind of bedrock high. It's sitting up there, you know, promontory location. It was the main area in the industrial area when they first were there. That was the place to be.

We also knew that, in some -- we have the former marshland that's located -- that's shown in the green here. We know that water is fairly shallow. That is being represented by this line right here. So some areas water is only a few feet deep, and other areas, like beneath the complex, we thought would be much deeper.

We also have -- we also placed on here some of the source areas that we thought have a potential to have -- that there was a potential -- a possible contamination in regards to a large vat that's currently in one of the buildings. With the overflow and the possibility of solvents heating up, overflowing, those type of things, could kind of flow into the saturated -- this is the soil that's saturated -- travel through and hit the water and then disperse out. Once it hits water, it'll just kind of disperse out. Other ways, it can go into drains, down in the drains, and some of the

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 2:15:03 PM

Sequence number: 2
Author: rpotter
Subject: Note
Date: 4/19/2006 2:17:23 PM
RAB BOARD MEETING 3/19/03 Wendy Linck. She is referring to the parkerizing room "57A" or 56

---

is probably what you've been waiting for -- all this setup, we're almost to the end -- the distribution of the chemicals of interest on all these sampling locations that we collected out there. Chlorinated solvents were found in all samples' matrices in soil, soil gas, and groundwater at the complex, including its degradation products. So TCE was the main, primary solvent out there being used, but TCE degrades into other chemicals, and we were analyzing for those as well. Now, that's a good thing. That means that the solvents are degrading and they're going -- you know, going its natural cycle. It's not sticking around. It's degrading and -- and trying to take care of itself on its own.

1 Those solvents are most likely the probable source of the degreasers and the parkerizing vat in Building 57A. They were likely introduced to the soil and then eventually traveled through the soil into the groundwater by that, from those vats, or a possibility that it could've been dumped directly into the former marshland. So this is all just similar things that pretty much substantiates our conceptual site model that we put together.

2

So this is a map, kind of a swirly one, but this is based on the data that we have today. And this

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 1:56:57 PM

Sequence number: 2
Author: rpotter
Subject: Note
Date: 4/19/2006 2:31:07 PM
RAB Board Meeting 3/19/03 . Wendy Linck is discussing the probable source for degreasors in Area I.

---

1 the old dump site area. So based on that, we took
2 that and looked over the data, and it was good data,
3 and so it appears that there's probably some kind of
4 DOD-associated impact there. So we're gonna probably
5 do a little more investigation there to figure out
6 where -- where it is.
7 MS. BARDET: Wendy, could you go back to the
8 slide before? You were looking for metals?
9 MS. LINCK: Yes.
10 MS. BARDET: And so you weren't looking for
11 solvents.
12 MS. LINCK: No.
13 MS. BARDET: Why was that? Because, I mean,
14 this whole investigation got started with a request
15 about TCE at Building 57, whatever it is, --
16 MS. LINCK: Right.
17 MS. BARDET: -- and so solvents is a big deal
18 in this arsenal, --
19 MS. LINCK: Right.
20 MS. BARDET: -- let alone hydrocarbons.
21 MS. LINCK: Right. And, you know, we base --
22 we're trying to find or base all of our information
23 based on substantiated or something that we knew that
24 was a clear record. You know, there's just so much we
25 can do. We know that the industrial area has

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Sequence number: 1
Author: rpotter
Subject: Highlight
Date: 4/19/2006 3:47:46 PM
RAB BOARD MEETING 11/17/04 Wendy Linck.

Trademark Assignment Abstract of Title

Total Assignments: 8

Serial #: 72190380 **Filing Dt:** 04/06/1964 **Reg #:** 0795059 **Reg. Dt:** 08/31/1965

Registrant: HOOKER CHEMICAL CORPORATION

Mark: PARKERIZING

Assignment: 1

Reel/Frame: 0216/0146 **Received:** **Recorded:** 02/07/1972 **Pages:** 3

Conveyance: ASSIGNS THE ENTIRE INTEREST AND THE GOODWILL

Assignor: HOOKER CHEMICAL CORPORATION **Exec Dt:** 02/02/1972
Entity Type: CORPORATION
Citizenship: NEW YORK

Assignee: OXY METAL FINISHING CORPORATION **Entity Type:** CORPORATION
21441 HOOVER RD. **Citizenship:** CALIFORNIA
WARREN, MICHIGAN 48093

Correspondent: OXY METAL FINISHING
P. O. BOX 201
DETROIT, MI 48220

Assignment: 2

Reel/Frame: 0256/0951 **Received:** **Recorded:** 08/27/1974 **Pages:** 1

Conveyance: CHANGE OF NAME

Assignor: OXY METAL FINISHING CORPORATION **Exec Dt:** 07/03/1974
Entity Type: CORPORATION
Citizenship: CALIFORNIA

Assignee: OXY METAL INDUSTRIES CORPORATION **Entity Type:** UNKNOWN
Citizenship: NONE

Correspondent: B. F. CLAEBOE
OXY METAL INDUSTRIES CORPORATION
P.O. BOX 20201
DETROIT, MI 48220

Assignment: 3

Reel/Frame: 0401/0385 **Received:** **Recorded:** 10/09/1981 **Pages:** 3

Conveyance: ASSIGNS THE ENTIRE INTEREST AND THE GOOD WILL EFFECTIVE AS OF JAN. 1, 1981

Assignor: OXY METAL INDUSTRIES CORPORATION **Exec Dt:** 10/07/1981
Entity Type: CORPORATION
Citizenship: CALIFORNIA

Assignee: HOOKER CHEMICALS & PLASTICS CORP. **Entity Type:** CORPORATION
Citizenship: NEW YORK

Correspondent: HOOKER CHEMICALS & PLASTICS CORP.
PLATING SYSTEMS DIV.

21441 HOOVER ROAD
WARREN, MI 48089

Assignment: 4

Reel/Frame: 0401/0382 **Received:** **Recorded:** 10/09/1981 **Pages:** 3

Conveyance: MERGER

Assignor: OXY METAL INDUSTRIES CORPORATION **Exec Dt:** 12/22/1981
Entity Type: UNKNOWN
Citizenship: NONE

Assignee: HOOKER CHEMICALS & PLASTICS CORP. **Entity Type:** UNKNOWN
Citizenship: NONE

Correspondent: HOOKER CHEMICALS & PLASTICS, CORP.
21441 HOOVER RD.
WARREN, MI 48089

Assignment: 5

Reel/Frame: 0422/0703 **Received:** **Recorded:** 06/02/1982 **Pages:** 3

Conveyance: CHANGE OF NAME

Assignor: HOOKER CHEMICALS & PLASTICS CORP. **Exec Dt:** 05/17/1982
Entity Type: UNKNOWN
Citizenship: NONE

Assignee: OCCIDENTAL CHEMICAL CORPORATION **Entity Type:** UNKNOWN
Citizenship: NONE

Correspondent: OCCIDENTAL CHEMICAL CORP.
21441 HOOVER ROAD
WARREN, MI 48089

Assignment: 6

Reel/Frame: 0450/0966 **Received:** **Recorded:** 10/26/1983 **Pages:** 2

Conveyance: ASSIGNS THE ENTIRE INTEREST AND THE GOODWILL

Assignor: OCCIDENTAL CHEMICAL CORPORATION **Exec Dt:** 09/28/1983
Entity Type: CORPORATION
Citizenship: NEW YORK

Assignee: PARKER CHEMICAL COMPANY **Entity Type:** CORPORATION
32100 STEPHEN HIGHWAY **Citizenship:** DELAWARE
MADISON, HEIGHTS, MICHIGAN 48071

Correspondent: PARKER CHEMICAL COMPANY
LEGAL DEPT.
32100 STEPHEN HWY.
MADISON HEIGHTS, MI 48071

Assignment: 7

Reel/Frame: 0657/0805 **Received:** **Recorded:** 06/12/1989 **Pages:** 0

Conveyance: MERGER

Assignors: AMCHEM PRODUCTS, INC. **Exec Dt:** 12/21/1988
Entity Type: CORPORATION
Citizenship: DELAWARE

PARKER CHEMICAL COMPANY **Exec Dt:** 00/00/0000
Entity Type: CORPORATION

Citizenship: DELAWARE

Assignee: HENKEL CORPORATION

Entity Type: CORPORATION

Citizenship: DELAWARE

Correspondent: HENKEL CORPORATION
SUITE 200, THE TRIAD
2200 RENAISSANCE BLVD.
GULPH, PA 19406

Assignment: 8

Reel/Frame: 2549/0418 **Received:** 07/25/2002 **Recorded:** 07/22/2002 **Pages:** 7

Conveyance: ASSIGNS THE ENTIRE INTEREST

Assignor: HENKEL CORPORATION

Exec Dt: 04/15/2002

Entity Type: CORPORATION

Citizenship: DELAWARE

Assignee: HENKEL KGAA
HENKELSTRASSE 67
DUESSELDORF, GERMANY D-40191

Entity Type: A PARTNERSHIP LIMITED BY SHARES

Citizenship: GERMANY

Correspondent: HENKEL CORPORATION
CHRISTEL EMERSON
2200 RENAISSANCE BOULEVARD
SUITE 200, LAW DEPT./TRADEMARKS
GULPH MILLS, PA 19406

Search Results as of: 04/14/2006 12:33 PM

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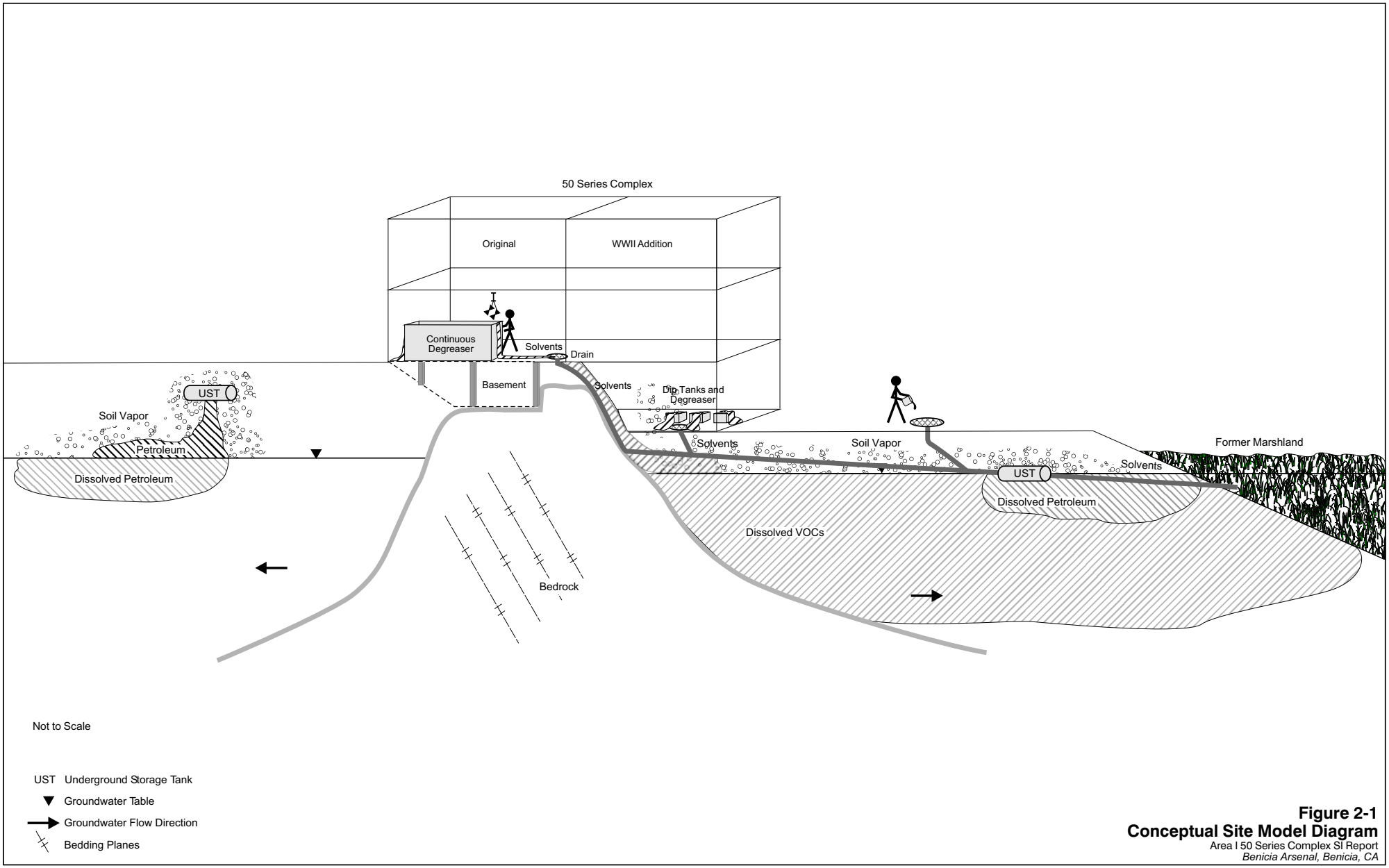


Figure 2-1
Conceptual Site Model Diagram
Area I 50 Series Complex SI Report
Benicia Arsenal, Benicia, CA

Photo MCV-004f. Woodworking equipment and materials inside Building 56B.

There are no features to investigate in Building 56C; therefore, no investigation activities are planned.

Building 57 - Small Arms Shop.
Investigation activities in Building 57 will be conducted in the north end of each of three firing ranges located in the basement, and in two basement areas with exposed soil. We will also investigate outside the building in the area adjacent to the former continuous degreaser.

- Three firing ranges end at an earthen berm. The potential of highest contamination is suspected to be at this berm. As a result, hand auger borings B057HA001 through B057HA003 are planned at the end of each range (Figure I5-7).

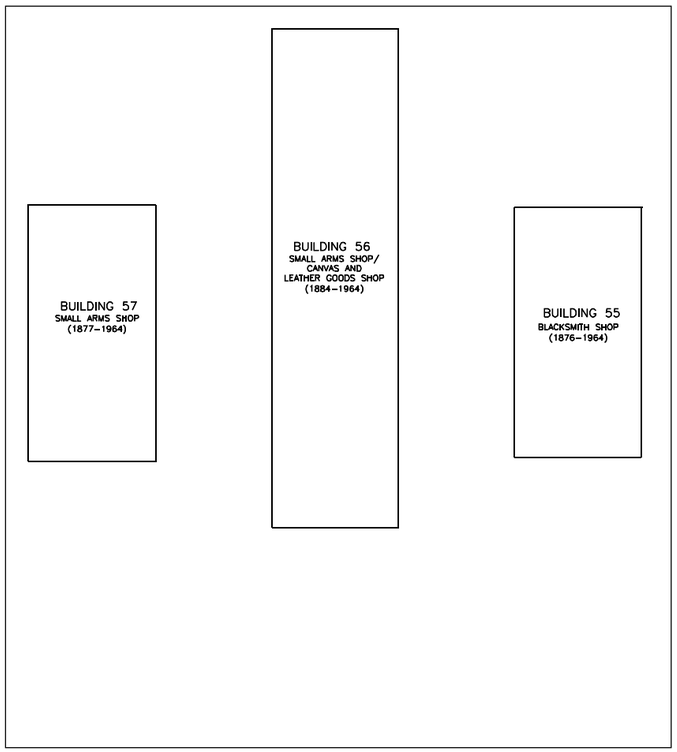
- There are two exposed areas of soil - one area near the westernmost range and one in a corridor along the eastern side of the basement area (this corridor leads to an elevator in the northeast corner of the basement). Hand auger borings B057HA004 and B057HA005 are planned in these areas (Figure I5-7). Drainage from the overlying parkerizing activities in Building 57 through the wooden floor is suspected. Photo PIC00032 shows the stained wooden floor of Building 57. The two exposed areas of soil appear to be low-lying, where accumulations of drainage water may have collected.

Photo PIC00032. Location of cleaning vats in Building 57.

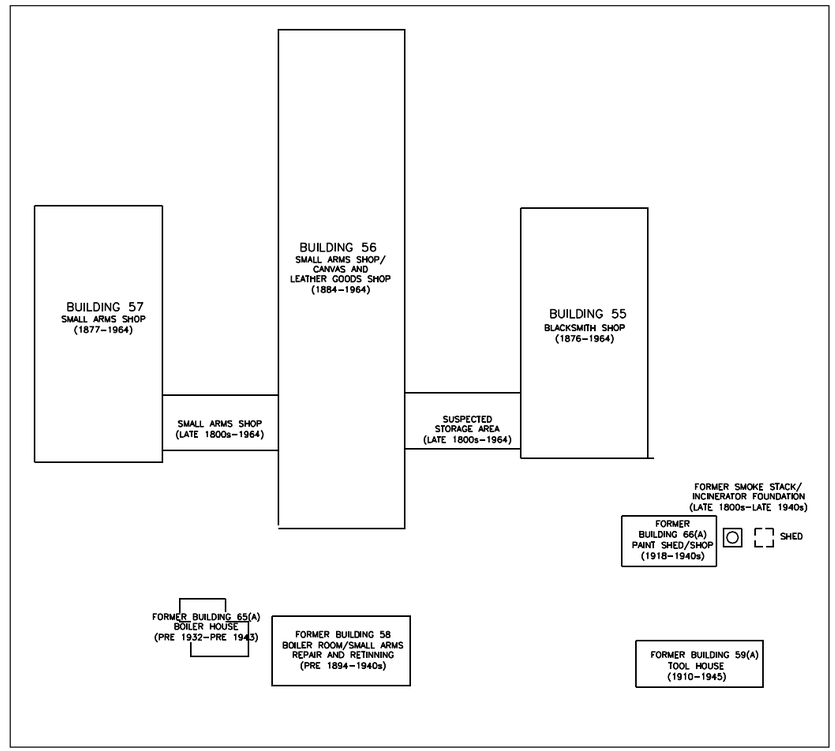
- Hydropunch® boring B057AHP007 is located along the western side of Building 57, next to the location of the former continuous degreaser inside Building 57, where the highest potential for contamination is suspected. Photo PIC00031 shows the former location of the degreaser.

Photo PIC00031. Location of former continuous degreaser in Building 57.

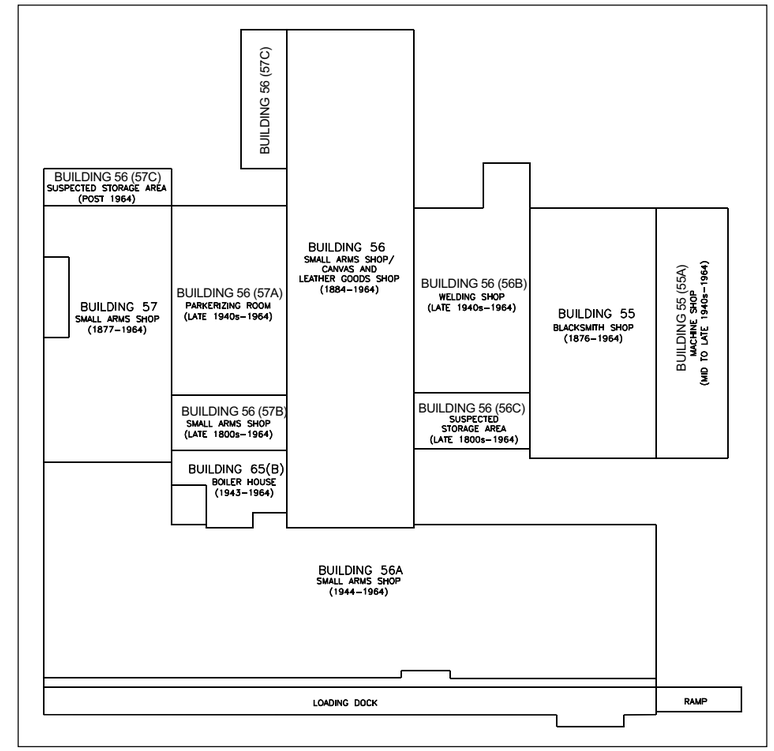
Building 57A - Parkerizing Room.
Previous data collected in Building 57A indicate an impact to soil in this area. Based on observed features (including a U-shaped, gravel-filled vat), historical use, and previous data, investigation activities in Building 57A will include one soil boring (B057ASB001), one Hydropunch® boring (B057AHP008) and one grab groundwater sample (B057AGR001) (Figure I5-6). The reasons for these sampling activities are described below.



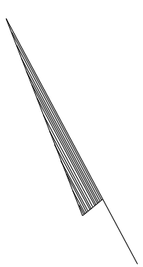
1870's



Late 1800's / Early 1900's
(Spanish American War/WWI)



1940's to Present
(WWII)



Present day building numbers are shown in parentheses( ), and are adopted in this report for consistency with other recent reports.

Figure 1-3
Historical Development
Area I 50 Series Complex SI Report
Benicia Arsenal, Benicia, CA

Area I, which contains several structures built in the mid to late 1800s, mainly served as an industrial and manufacturing area. Several machine shops were located in Area I, as were a blacksmith shop, welding shop, numerous vehicle and artillery repair shops, small arms shops, administrative offices, most of the permanent housing sites, photographic laboratories, a firehouse, and a hospital (PA ref 1000). Area I also had the wharf facilities and storehouses on its southern shore that were used for shipping and receiving equipment and supplies throughout the Arsenal's history.

Industrial and manufacture shop buildings in Area I were primarily used for the repair and preservation of military materiel. Area I buildings included a Small Arms Shop, the Combat Vehicle and Artillery Repair Shop, Engine Rebuild Shop, Locomotive Building, Steam Cleaning Building, Paint Shop, Motor Test Shed, Battery Charge Building, and numerous other PA sites.

Many of these buildings were equipped with boilers that were originally coal burning, but were later updated to use fuel oil, diesel fuel, or natural gas. Mr. Jim Milburn, a former Arsenal employee, recalls that Number 5 heavy fuel oil was delivered hot in order to fire some of the boilers (PA ref 1000). An article published in the Benicia Bomber, dated January 1952, stated that shop boilers served as the source of heat and steam for hot alkali, acid, and rinse tanks, vapor degreasers, hot preservative tanks, preservative removal, and paint drying (PA ref 1000). The boilers were also used to heat the buildings.

The industrial and manufacturing shops in Area I predominantly used acids to clean metal parts, but some solvents and various other potentially hazardous materials were used. Records identify the use of acid baths as early as 1914. A request, dated August 31, 1914, was made for the installation of exhaust fans and accompanying piping to remove harmful gases from the acid baths and protect employees (PA ref 1000). Stock/inventory reports identify boric acid, sulfuric acid, hydrochloric acid, phosphoric acid, potassium hydroxide, chromium hydroxide, ethyl ether, chromium trioxide, and chromium potassium as chemicals used at the site. Phosphoric acid was used in conjunction with vapor degreasing, emulsion cleaning, alkali cleaning, and paint stripping. Other compounds used in these processes included methyl ethyl ketone (MEK) (for paint stripping), acetone, and trichloroethene (TCE) (PA ref 1000). TCE was used in vapor degreasers in seven of the shop buildings (31, 48, 56A, 57, 91A, 70-131, 165) as of 1952 (PA ref 1207).

A number of buildings located in Area I had phosphoric acid dipping tanks, which reportedly were emptied every two to three weeks. The exact disposition of material in these tanks is not clear from the report. However, interviews with Arsenal personnel indicate that the phosphoric acid dipping tanks were emptied into the Carquinez Strait via storm drains and the sanitary system (PA ref 1000). Buildings 161 and 165A had smaller hydrochloric acid tanks that were emptied every four weeks. Sulfuric acid from battery reclamation operations was dumped into the storm drainage system at Building 101 (PA ref 1000). A paint-stripping compound was used in combination with a resin for the caustic dipping grease-removal operation. In 1952, there were 12 caustic tanks in operation, each with a 1,000-gallon capacity. Every three weeks, each tank was dumped directly into the floor drains connected to the storm drain system. The caustic tank in TO131 was emptied directly into the sanitary sewer system (PA ref 1000).

The preservation process involved dipping small parts into either hot or cold chemical preservative baths. The parts were dried before being sprayed with a light oil/wax application and/or paint. A vapor process was used to clean small arms, gears, and bearings. The degreasing units were constructed in two sizes. The larger units had continuous distillation tanks that separated grease from the TCE cleaning solvent. Solvent residues were collected in drums and hauled to the dump (Landfill 3 in Area M) for burning. The smaller degreasing units did not have stills to purify the solvent, so spent solvent was dumped periodically to locations that are currently unknown. The quantity dumped was estimated in 1952 to be 100 gallons per month per unit. Sumps under the painting booth spray towers were cleaned weekly. The sludge from these sumps was hauled away and the excess water dumped into the storm drain system (PA ref 1000).

Historical records have identified eleven fuel storage sites in Area I (PA ref 1000). The sites include service stations and fuel storage tanks associated with engine rebuilding and testing operations.

Area I also contained 11 storehouses, one of which dates back to 1859 (Building 29). The remaining storehouses were constructed between 1910 and the mid 1940s. According to historical data, five storehouses were constructed between 1917 and 1922 to receive unused supplies returned from World War I (PA ref 1000). The limited specific information that is available regarding materials in the storehouses are included in the PA Summary Forms provided in Appendix A.

There were eight carpenter shop sites in Area I constructed between 1943 and 1953 in an area east of Bottle Hill. According to an article in the Benicia Bomber, dated March 1952, all lumber that was purchased by the Arsenal was in the "rough state." The carpenter shop would then cut the lumber to the required size and finish it (PA ref 1000). The carpenter shops were also said to salvage used lumber for reuse and for the manufacture of reclaimed wood products.

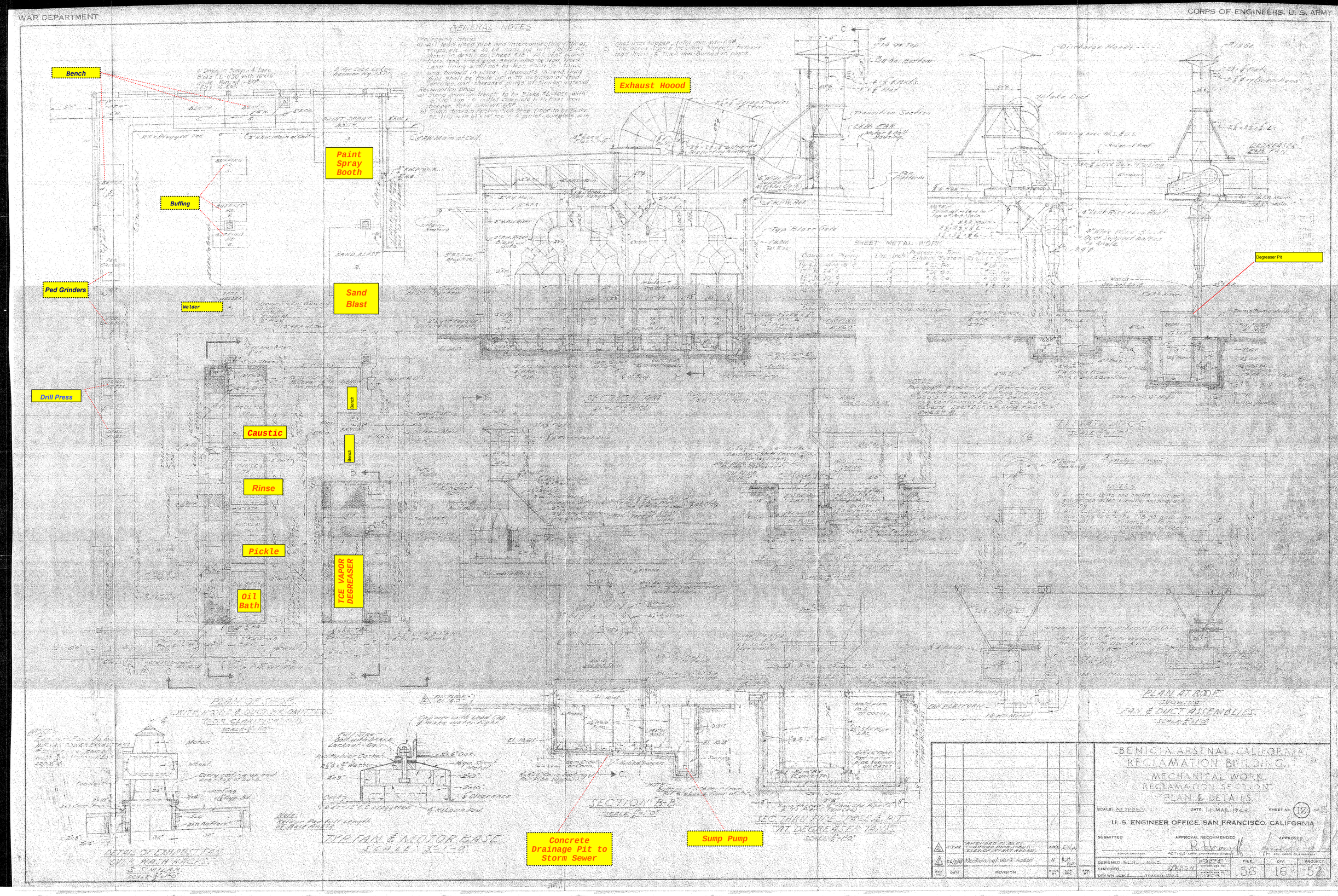
Many temporary housing structures were built throughout the history of the installation. There was a structure located on Bottle Hill that temporarily housed German prisoners of war. Italian prisoners of war were temporarily housed in Area M (PA ref 1000).

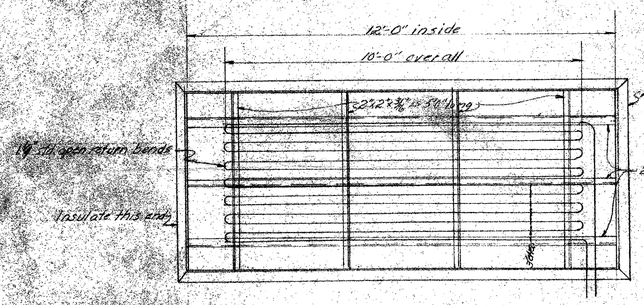
Five housing structures have been identified in Area I, including one hospital, one fire station, several administrative offices, and photographic laboratories. Storage tanks were installed at most of the housing structures to provide fuel for space heating. Many of these fuel storage tanks have been removed. Detailed information on the removal and status of each storage tank, referred to as (vessel), are included in the PA Summary Forms provided in Appendix A.

There were a number of rock outcrops in Area I that were used as quarries to provide sandstone block for the construction of Arsenal buildings or as fill for site-leveling and foundations. According to the RRR, quarry sites also may have served as landfills (PA ref 1000). Subsequent investigations completed at these quarries indicate that they were not used as landfills but rather as fill areas for excess construction soil.

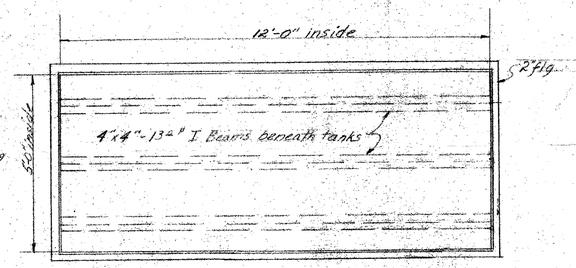
613 CE

Building 165 - Reclamation Building

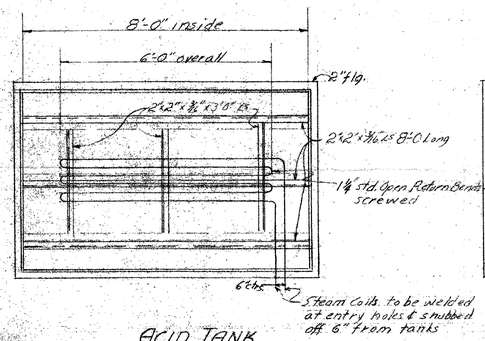




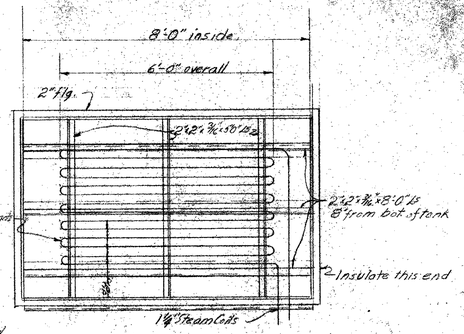
PAINT STRIP TANK
R.H. as shown L.H. opposite conn.
Insulated both sides & end end



STEAM JET TANK
No conn. Insulated both sides

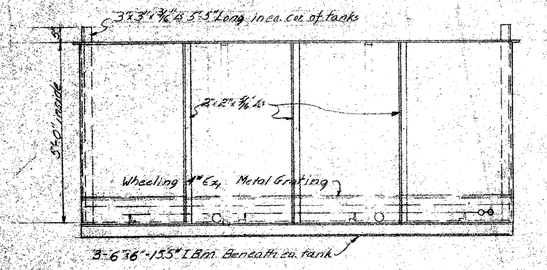


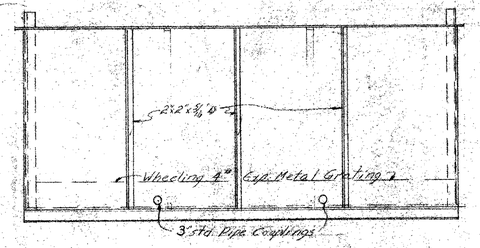
ACID TANK
R.H. as shown L.H. Opposite
Insulated both sides

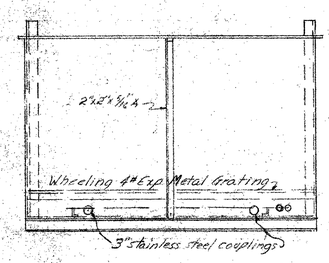


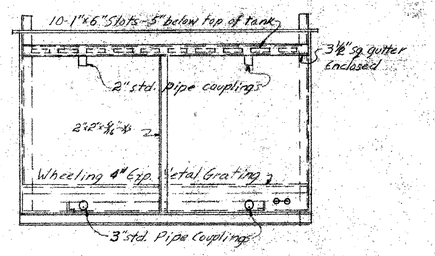
WATER RINSE TANK
R.H. as shown L.H. opposite
Insulated both sides & one end

PLAN
Scale ½"=1'-0"

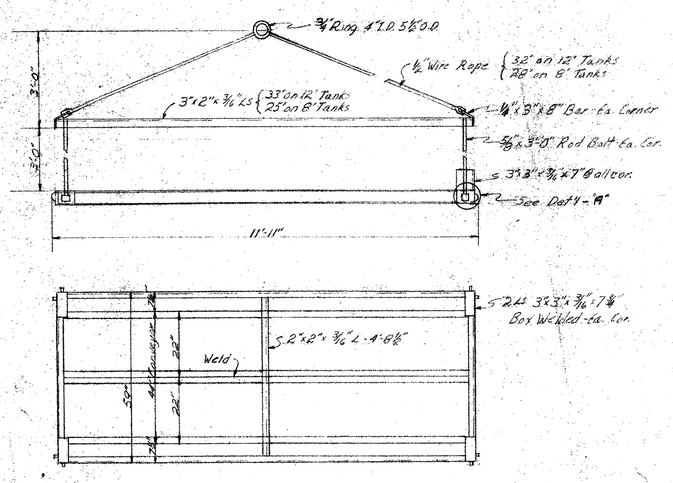




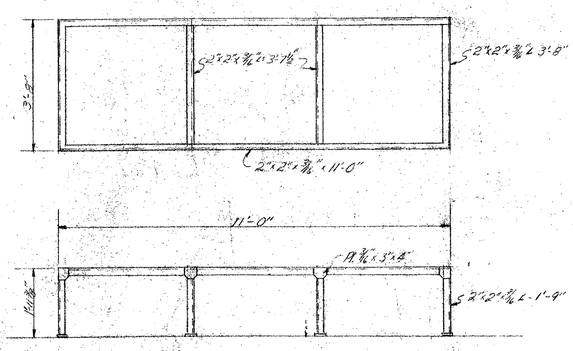




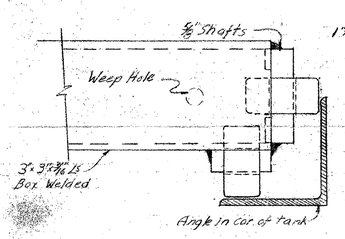
ELEVATION
Scale ½"=1'-0"



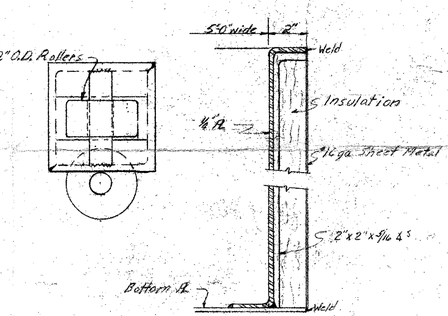
LIFTING RACK & BRIDLE
Shown for 12' Tanks
4' Shorter for 8' Tanks
Scale ½"=1'-0"



LIFT STAND
Scale ½"=1'-0"



DET'L. - "A"
Scale 6"=1'-0"



TYP. SECT. THRU TANK
No Scale

Note: Use only Black Iron for all Tanks except Acid. Use 3/16 Stainless steel PL & stainless steel coils & drain in Acid Tank.

DATE	REVISIONS	MADE BY	APP BY
9-22-50	ADD NOTE - CHANGED 1/4" SPACING - CHANGED METAL STRIPS TO L-2	WED	

TANKS FOR POWER TRAIN REBUILD
OFFICE OF THE POST ENGINEER
BENICIA ARSENAL CALIFORNIA

WED William J. Locke
Maj. R. Arthur William J. Locke Maj. C.E. Post Eng.
R.S. Chavin
R.S. Chavin Col. Ord. Corps Comdg.

8/18/50 | 4685 | 91-78

Enlarge Existing To 8'-0"

℄ 4' Door

N

℄ 4' Door

℄ 4' Door

BLDG. T.O. 131

Condenser

MEN

WOMEN

Boiler Room

1" Fire Water
1½" Steam Return } Overhead
2" Steam Line
4" C.I. Drain Line

220-V-½ H.P.

Enlarge Existing Door To 8'-0 Doorway

8'-0"

Bring Canvas Do
& Lap Over Celiglas

To Sanitary Sewer 4" C.I. On Floor

Rinse Tank

Alkali Tank

Rinse Tank

Acid Tank

14'-0"

Degreaser Pit (See Detail)

Degreaser

7'-0"

Still

220-3 ϕ-10½ H.P.

℄ Monorail

Paint Booth

4'-0" Wide Celiglass Entire
Length Of Shelter - Lapped
2" On Plate & Header

Provide Flashing Unde
Celiglass & Over
Gutter

℄ Monorail

5-300-W Vapor Proof Inc.

2-40-W

Catwalk - 20" High

1½" Steam Line
1" Return - Overhead

2-40-W

CANVAS COVERED SHELTER

6" GI. Gutter Slope
1" In 24'
(Check Dimensions In The
Field)

Roto-Blast
22 V 3 ϕ 22 HP.

110 V-1 HP. Buffers

5-300W Vapor Proof Inc.

Hot Tank
284-13

Drain Board

Hot Tank
1347

Drain Board

Cold Tank
613

Drain Board

1759

Drain Board

2-122

Drain Board

110 V-1 HP. Buffers

Bench

Bench

Bldg. T.O. 131

10'-8" 10'-8" 10'-8" 10'-8" 10'-8" 10'-8" 10'-8" 10'-8" 10'-8" 11'-6"

108'-0"

PLAN

SERIAL NO. 524

R & U DIVISION

SECT.
Flashing Gutt
Scale

For Framing Detail
Drawings No. 4854

SHEET 1 OF

GENERAL LAYO
COVERED
BUILDING

OFFICE OF THE
BENICIA ARSENAL

Designed C.S.

Submitted

Approved

April 18-51

Rinse Tank

30"

4'-6"

2"

Tanks Supported On 3-6"X6" Redwood Timbers

2" Blacktop

6" Crushed Rock

Degreaser

NOTE:
Cover Pit Around
Degreaser With 2" Planking

3'-0"

2'-6"

Degreaser To Set On Redwood Timbers &
Level To Height Of Tanks

Bldg T.O. 131

LEGEND

- Steam Line From Generator
- Steam Line Return
- Fire Water
- Drain Line From Tanks
- 2-40-W Fluorescent Fixtures
- 300 W-Vapor Proof Incandescent
- Lighting Panel
- Power Panel

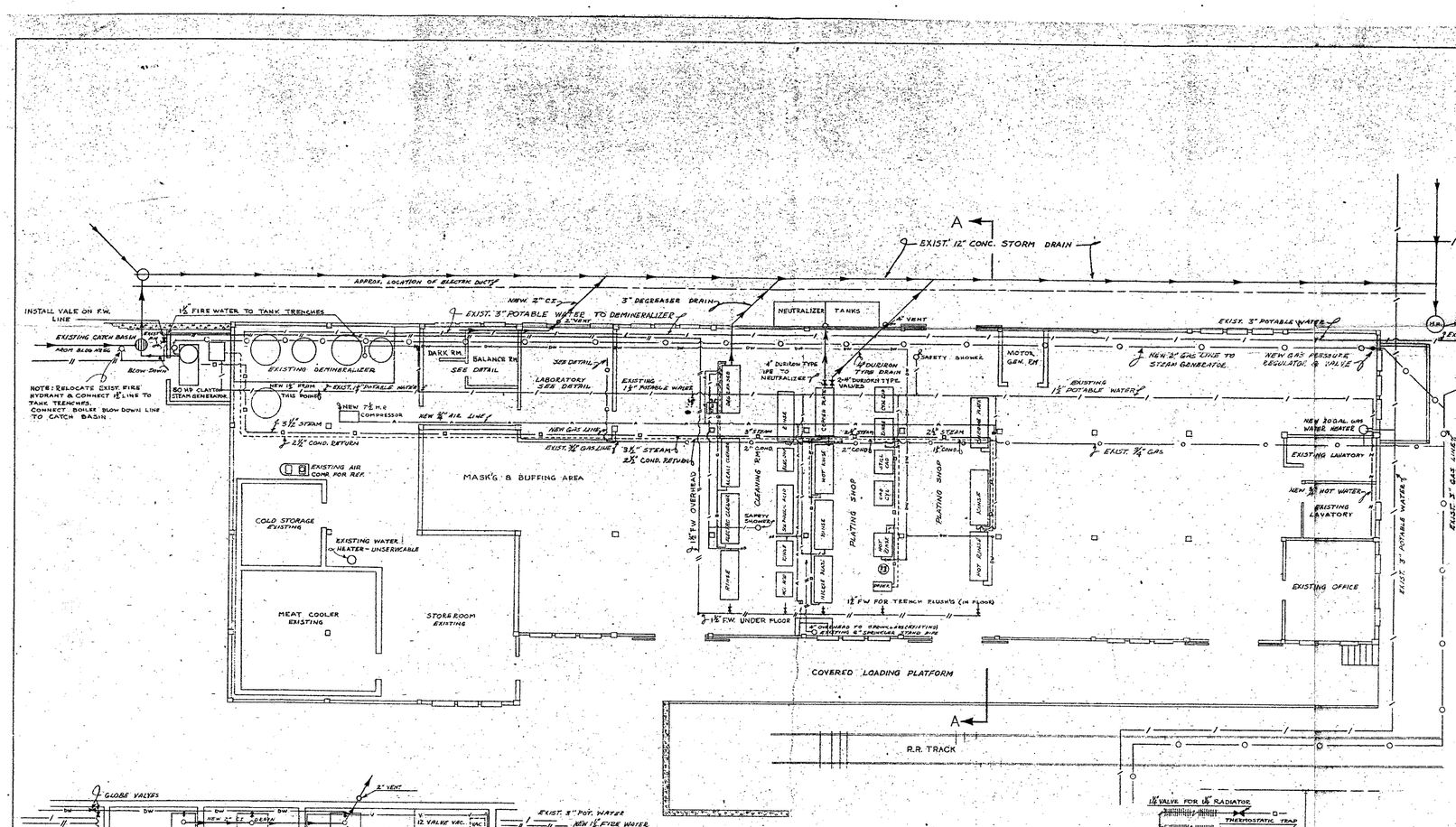
ND VIEW OF TANKS

ELEVATION OF TANKS & DEGREASER PIT

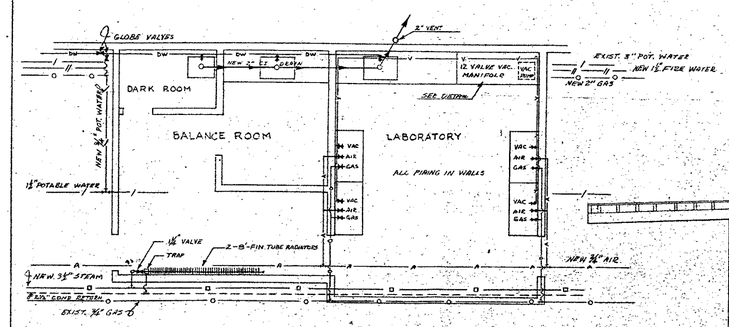
END VIEW OF DEGREASER PIT

300 NPRC

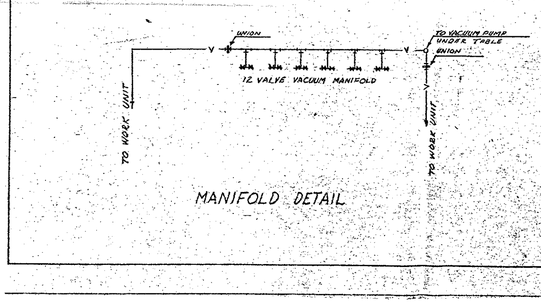
338-56-A-3099 Incl 8



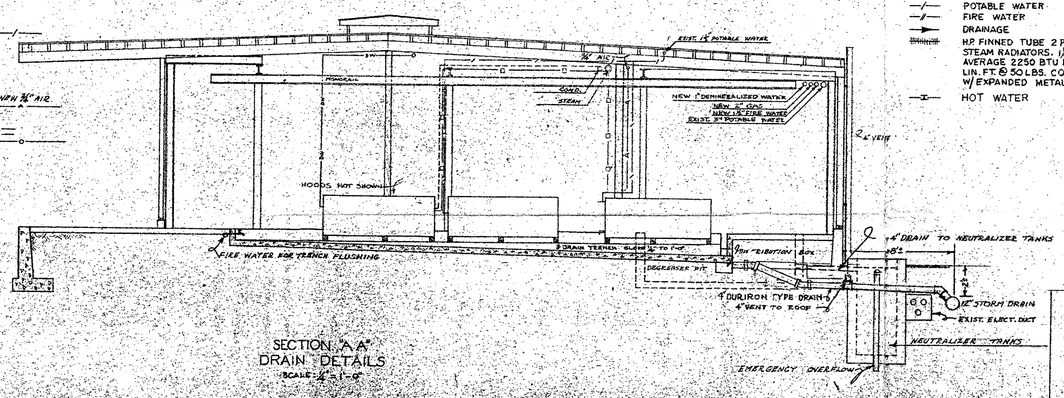
PLUMBING PLAN
SCALE: ⅛" = 1'-0"



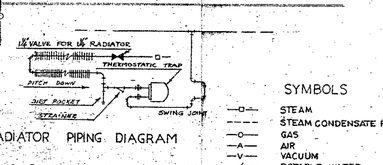
PLUMBING LAYOUT BALANCE & LABORATORY
SCALE: ¼" = 1'-0"



MANIFOLD DETAIL



SECTION "A-A"
DRAIN DETAILS
SCALE: ¼" = 1'-0"



RADIATOR PIPING DIAGRAM

SYMBOLS

- STEAM
- STEAM CONDENSATE RETURN
- GAS
- AIR
- VACUUM
- POTABLE WATER
- FIRE WATER
- DRAINAGE
- H.P. FINNED TUBE 2 PIPE STEAM RADIATORS. 1¼" IPS AVERAGE 2250 BTU PER LIN. FT. @ 50 LBS. COVERED W/ EXPANDED METAL.
- HOT WATER

LIST OF GOV. FURNISHED MATERIALS PERTAINING TO THIS DRAWING - MATERIALS SHOWN BUT NOT LISTED TO BE SUPPLIED BY CONTRACTOR —

1. 50 HP CLAYTON STEAM GENERATOR — 1-EA. 7½ HP AIR COMPRESSOR.
2. LABORATORY — 1-EA. (ALBERENE STONE) SINK - 30" x 20" x 10" & 24" x 36" x 10" 2-EA. STRAINERS (DURIRON). 2-EA. OVERFLOWS (OPEN END DURIRON) 2-EA. "P" TRAP; CENTR. (DURIRON) 1¼". 1-EA. SINK (CHEM. STONEWARE) 30" x 20" x 14" - COMP. WITH STRAINER & TRAP. 12-EA. NEEDLE VALVES. 36-EA. PLUG COCKS (AIR, WATER, - GAS, & VACUUM) FOR WORK TABLE UNITS.
3. CLEANING ROOM — 1-EA. DEGREASER 102" L x 56" W x 72" H W/STILL. 2-EA. TANKS - STEEL W/COIL - 8' x 3' x 3'-6" DEEP (ALKALI & ELECTRO-CLEANER). 2-EA. TANKS - STEEL W/O COIL - 8' x 3' x 3'-6" DEEP (RINSE). 3-EA. TANKS - STEEL W/O COIL 4' x 3' x 3'-6" DEEP (ELEC. SULF-RINSE & HCL ACID - BRICK LINED - TO BE FABRICATED BY BENICIA ARSENAL). 1-EA. TANK RUBBER LINED 8' x 3' x 3'-6" FOR SULPHURIC DIP - ON HAND.
4. PLATING SHOP — 1-EA. - TANK STEEL - RUBBER LINED - 8' x 3' x 3'-6" DEEP (COPPER PLATE). 1-EA. TANK - 8' x 3' x 3'-6" DEEP - 2 HEATING & COOLING COILS - ANODE & CATHODE RODS. INCL. (NICKLE PLATE). 1-EA. - STILL CAD. PLATING TANK WITH 6V. RECTIFIER - 4' x 3' x 3'-6" DEEP. 1-EA. CADMIUM PLATING CYLINDER - 41½" x 30" x 30" DEEP W/6V. RECTIFIER. 1-EA. CADMIUM PLATING BARREL - 3' x 3' x 4' HIGH W/6V. RECTIFIER. 1-EA. DRIER (NEW HOLLAND). 1-EA. CHROME PLATING TANK 6' x 3' x 3'-6" DEEP - 2 HEATING & COOLING COILS, ANODE & CATHODE RODS INCLUDED. 2-EA. THERMOMETER CONTROL - BROWN MODEL #604 PID-7T - SCALE No 74091-323 FOR CHROME & NICKLE TANKS. VALVES FOR CHROME TANK INSTRUMENT - 1-EA. 7½ LB. SPRING LOADED - 1-EA. - 7½ - 15 LB. SPRING LOADED. 1-EA. - STEAM VALVE FOR NICKLE PLATE CONTROL INSTRUMENT. 4-EA. TANKS - STEEL - 8' x 3' x 3'-6" HIGH - 2 W/COIL (HOT RINSE) & 2 W/O COIL (COLD RINSE). 3-EA. TANKS - STEEL 4' x 3' x 3'-6" HIGH - 1 W/COIL (HOT RINSE) & 2 W/O COIL (CYNANIDE DIP & COLD RINSE) TO BE FABRICATED BY BENICIA ARSENAL.

NOTE:

1. TO PREVENT BOILER CONTAMINATION STEAM TRAPS FROM ALKALI & ELECTRO CLEANER, COPPER, NICKLE, & CHROME PLATE TANKS WILL DISCHARGE INTO DRAIN TRENCHES.
2. WATER LINES FROM DEMINERALIZER TO TANKS TO BE COPPER TYPE "L" HARD OR EQUAL.
3. CHECK ALL DIMENSIONS IN FIELD BEFORE CONSTRUCTION.
4. ALL PIPING INCLUDING INSULATED PIPING TO BE PAINTED (REFER TO SPECIFICATION). PIPING TO BE COLOR CODED AS DIRECTED BY THE CONTRACTING OFFICER.

PLUMBING PLAN
SHEET 5 OF 13 SHEETS

DATE	REVISION	BY	APPD

LAB. & ELECTRO PLATING FACILITIES IN BLDG. 120

OFFICE OF THE POST ENGINEER
BENICIA ARSENAL - CALIFORNIA

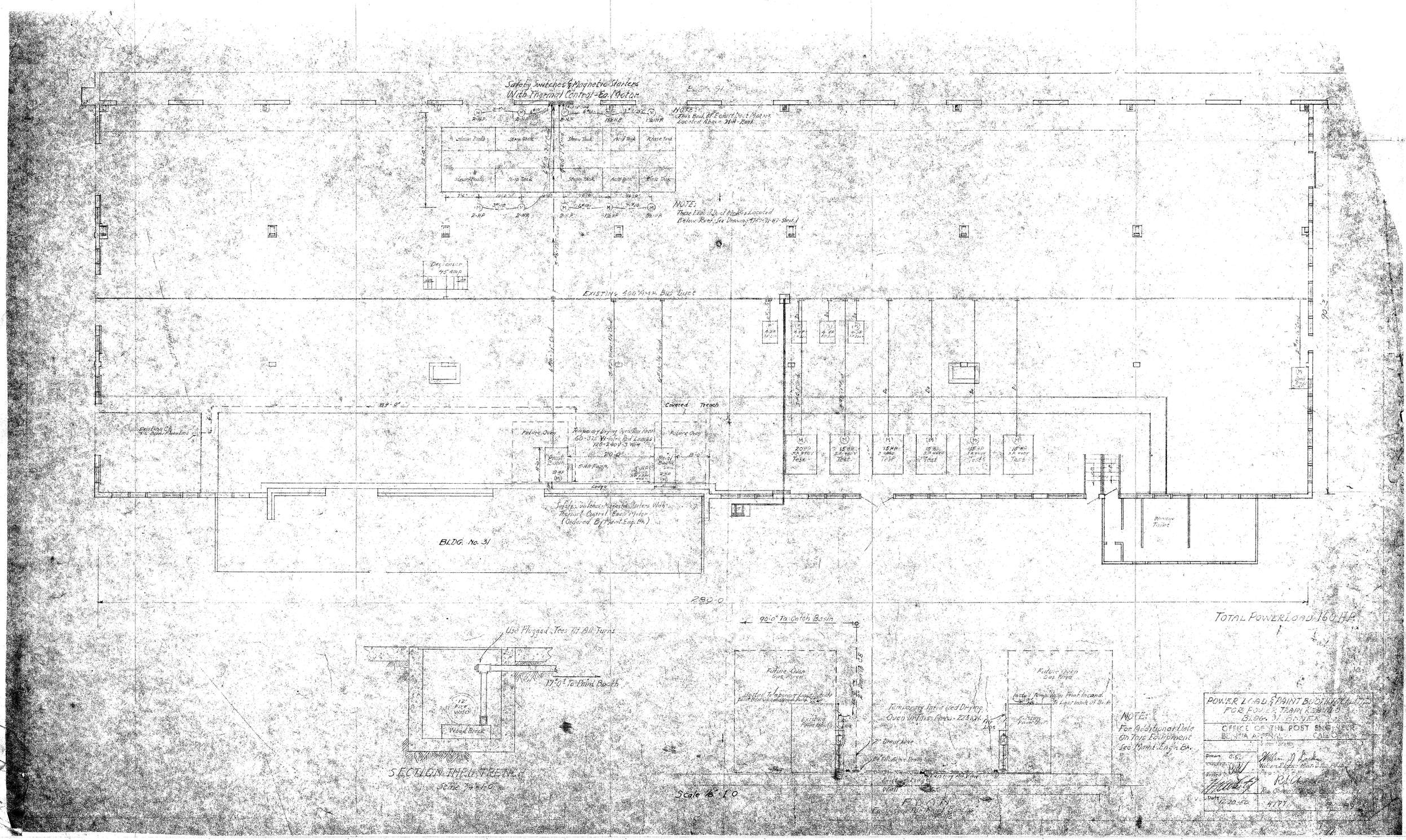
Designed C.S.
Drawn Sherrard
Reviewed F.B.S.
Checked
Final
Submitted Frank L. Columbia
FRANK L. COLUMBIA MAJ. CE POST ENG'R
Approved Maurice J. Hall
MAURICE J. HALL LT. COL. CORPS CORPS
Date 12 MARCH 1953
Drawing 5454
File 120-12

120

318 NPRC

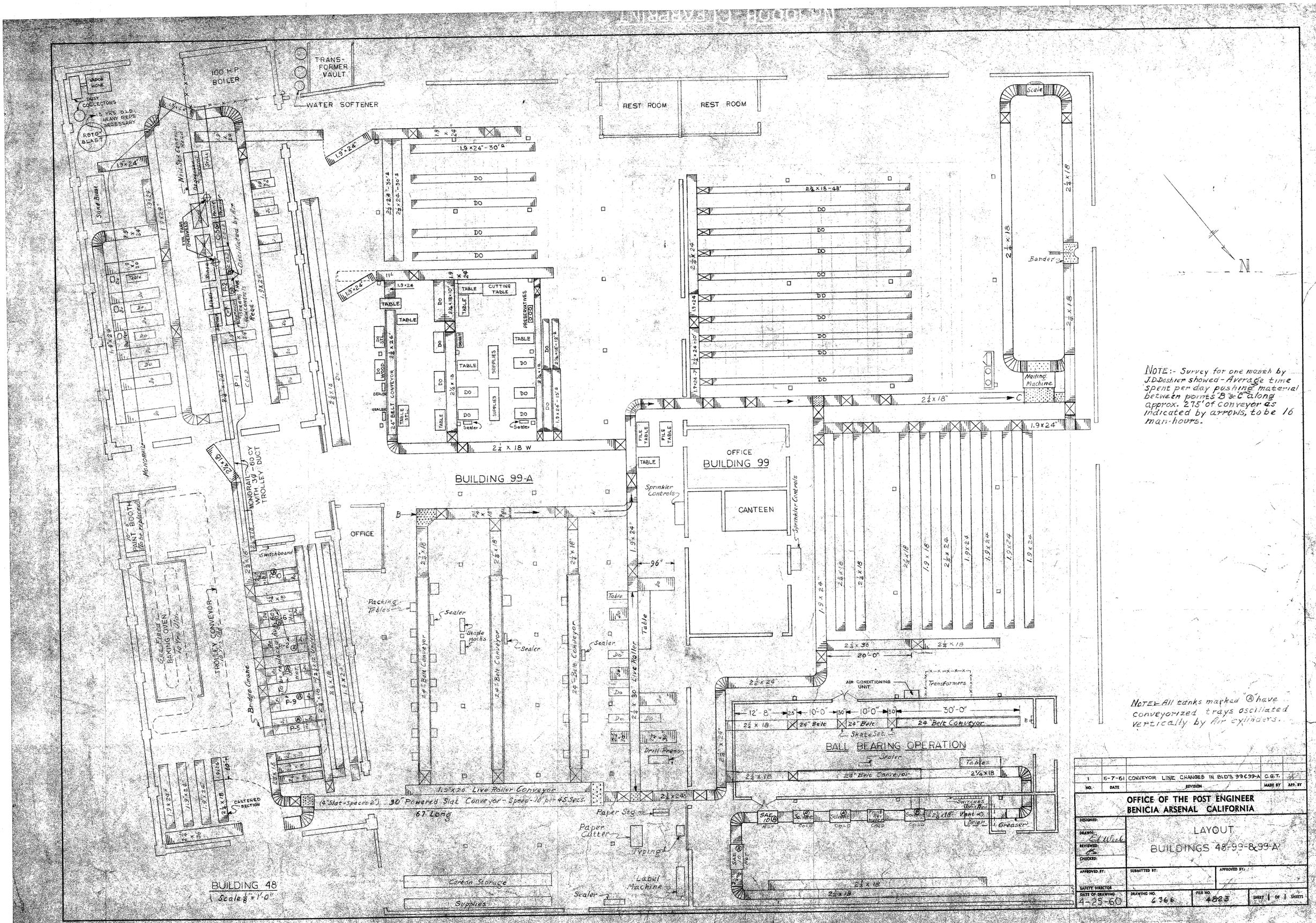
222-56-A-3099

628 CE


Safety Switches & Magnetic Starters
With Thermal Control to Motor
NOTE:
This Bldg. Of Concrete Wall Motors
Located Above Roof
NOTE:
These Bldg. Wall Motors Located
Below Roof. See Drawing 4177-17-87 Sheet 1
Steam Boiler
Steam Tank
Steam Tank
Acid Bath
Rinse Tank
Steam Boiler
Steam Tank
Steam Tank
Acid Bath
Rinse Tank
Dehumidifier
45 Amp
EXISTING 400 AMP. BUS DUCT
Covered Trench
Existing Oil & Air Boiler Pipeline
Future Oven
Temporary Drying Oven Use Two Sets
60-375 W Infra Red Lamps
120-240V-3 Wire
20 Ω
Future Oven
Boiler Blower
Boiler Blower
Ladder
Safety Switches Magnetic Starters With
Thermal Control Each Motor
(Ordered By Maint. Eng. Br.)
BLDG. No. 31
Window Toilet
280'-0"
90'-0" To Catch Basin
TOTAL POWER LOAD 160 H.P.
Use Plugged Tees In All Turns
17'-0" To Paint Booth
12" Fire Water
Wood Block
SECTION THRU TRENCH
SCALE 3/4"=1'-0"
Future Oven Gas Pipe
Future Oven Gas Pipe
Temporary Infrared Drying Oven Unit Power - 225 KW
Existing Paint Booth
2" Drain Line
Existing Paint Booth
Scale 16'=1'-0
NOTE:
For Addition of Data
On This Equipment
See Maint. Eng. Br.
POWER LOAD & PAINT BOOTH
FOR POWER TRAIN REPAIR
BLDG. 31 BENEFIT
OFFICE OF THE POST ENGINEER
BUILDING DIVISION
Drawn G.S.
Traced
Checked
Approved
Date 12-20-40
4177

19

392CE



NO.	DATE	REVISION	MADE BY	APP. BY
1	6-7-61	CONVEYOR LINE CHANGES IN BLD'S. 99 & 99-A	C.G.T.	

OFFICE OF THE POST ENGINEER
BENICIA ARSENAL CALIFORNIA

DESIGNED:
DRAWN: E. Week
REVIEWED:
CHECKED:
APPROVED BY:
SAFETY DIRECTOR

LAYOUT
BUILDINGS 48-99-&99-A

SUBMITTED BY:
APPROVED BY:

DATE OF DRAWING: 4-25-60
DRAWING NO. 6366
FILE NO. 4823
SHEET 1 OF 1 SHEETS