14. Surface Cleaning

Surface cleaning, synonymously referred to as dry cleaning, is a mechanical cleaning technique used to reduce superficial soil, dust, grime, insect droppings, accretions, or other surface deposits. (Dry cleaning, as the term is used in paper conservation, does not employ the use of organic solvents.) Surface cleaning may be used as an independent cleaning technique, as one step (usually the first) in a more comprehensive treatment, or as a prelude to further treatments (e.g., aqueous immersion) which may cause dirt to set irreversibly in paper fibers.

14.1 Purpose

The purpose of surface cleaning is to reduce the potential for damage to paper artifacts by removing foreign material which can be abrasive, acidic, hygroscopic, or degradative. The decision to remove surface dirt is also for aesthetic reasons when it interferes with the visibility of the imagery or information. A decision must be made balancing the probable care of each object against the possible problems related to surface cleaning.

14.2 Factors to Consider

14.2.1 Chemical Compositions and Physical Natures of Surface Cleaning Materials (Erasers)

There are three basic types of eraser materials generally used by paper conservators: vinyl (usually contains polyvinyl chloride, phthalate plasticizer, and calcium carbonate); factice (vulcanized vegetable oils cross-linked with sulfur bonds); and rubber (rubber, drying oils, sulfur, and abrasives). Other substances are also used for surface cleaning materials, such as starch and silicone-based erasers. Detailed information concerning chemical composition can be found in 14.3.1 Eraser Materials.

A. Materials of known composition are preferable. Manufacturer's formulations may change and provided product information may not be adequate for conservation purposes. Reliable sources of eraser products should be selected. Conservation-related studies can provide information on product composition, stability, and aging. (See annotated bibliography.)

Some components, or the amount of a given component in an eraser, may adversely affect the quality of the eraser material and the treatment results. Factors that may

adversely affect paper and other supports are: abrasives, sulfur, calcium carbonate (pH), hydrochloric acid, plasticizers, drying oils, etc.

B. Physical properties of erasers, such as stiffness, tackiness, and abrasiveness affect the efficiency of surface dirt removal and the possibility for damage to the artifact. Eraser materials should be selected that will not damage or physically alter paper surfaces and media.

C. Dry cleaning materials can be adapted to minimize physical damage to papers; for example, grated erasers are often more gentle than solid blocks.

D. Variation in size and fineness of particles contributes to the effectiveness of cleaning, and minimizes the possibility of disturbing the paper surface. For instance, a smoother surfaced paper may require the use of very fine eraser crumbs, while a rough surfaced watercolor paper may benefit from application of something coarser, and therefore less likely to become trapped in the irregularities of the surface texture. The fineness or coarseness of eraser crumbs can vary due to manufacture, or can depend on the degree of sharpness and roughness of a grater's surface if prepared by the conservator. (BMH)

E. The ease of eraser residue removal, and the amount and aging characteristics of residue remaining in an artifact, may influence selection of an eraser product or method of application.

14.2.2 Potential Alteration/Damage to Object

Surface cleaning may alter the support and media in objects selected for treatment. Potential alteration or damage to the object should be carefully considered prior to treatment. The following elements should be examined:

A. Supports: The physical characteristics of a paper support may be adversely affected. Safe treatment may depend on paper strength, pliability, density, etc. The paper quality may be a result of: type of pulp or formation technique (rag, wood, leaf, grass; machine or hand-made; calendaring); furnishes, coatings and other additives (sizing, fillers, dyes, whiteners, coatings, anti-flocculants, etc.); age; and previous use.

Potential damages from dry cleaning may include: planar distortion, abrasion, roughing of fibers, compression of paper fibers, tears, detachment or loss in areas of previous support insecurities; change of surface gloss or texture; chemical reactions with the fibers and/or additives in the paper.

Consideration should be given to avoiding surface cleaning on compressed printed paper, such as the plate area of an intaglio print. This can rough up the surface of the paper, altering its inherent character. (FZ)

For additional information, see AIC/BPG/PCC 4. Support Problems, 1991.

B. Media: Media may be adversely affected by direct application of surface cleaning materials. Many types of media cannot withstand surface cleaning. Potential damages may include: changes in surface gloss and/or texture (e.g. silkscreens, mezzotints, and other printing techniques); color changes (e.g., blueprints, photographs); loss or disruption of friable media, (e.g., chalk, charcoal, pastel, soft graphite, some drawing and printing inks).

Some conservators will never surface clean over design media (except perhaps with a soft brush, or in extreme cases) as abrasion or loss of media may be imperceptible but may occur. (NA)

For additional information, see AIC/BPG/PCC 3. Media Problems 1985.

C. Other Components: Seals, stamps, labels, collaged pieces, photographic elements, etc., may require special cleaning considerations.

14.2.3 Extraneous Surface Materials of Historical/Artistic/Archival Importance

Extraneous surface materials may be an historical record of use or construction. Curators or custodians of the artifacts should be consulted regarding the potential information provided by surface materials and the extent of possible treatment.

A. In some cases, it may be decided not to remove marks made during construction, including: fingerprints, inscriptions, smudged and displaced media, offset images, "studio dirt," etc.

Artists' sketchbooks present a dilemma. Surface "dirt" may include: dusting or smudging of media, general studio dust and grime, stains and smudges from other media in the studio (paint, oils, chalks, etc.), indications of artist handling (fingerprints, footprints.) There is often a temptation to "clean up" these drawings, and in some cases subtle cleaning may be appropriate. Such treatments should be undertaken with caution because the accumulated surface dirt may be regarded as an integral part of the artifact. A decision to undertake such a treatment should be considered carefully by both the conservator and custodian. (NA) Off-set images may help identify page order or loss to the sketchbook construction. (FZ)

B. Residual construction materials, such as adhesives and tapes, may provide additional information regarding the artist's working technique or creative intention.

C. Marks pertaining to provenance: registration marks, annotations, collector's stamps, framer's marks, prices, etc.

14.2.4 Types of Extraneous Surface Materials

A. Soil, Dust

B. Soot/grime, with a grease or oil content

C. Airborne pollutants

D. Fingerprints/footprints

E. Accretions (fly excrement, webs, casings,) adhesives, wax, sugars, etc.

F. Mold

G. Smudged or displaced media

H. Adhesive and other construction materials

I. Leather dust from bindings (red rot)

J. Vandalism and accidental application of media

K. Remnants of previous conservation treatment (e.g., eraser crumbs)

L. Glass fragments (from breakage)

14.3 Materials and Application Accessories

14.3.1 Eraser Materials

The following products are included in this chapter because they tend to be the most commonly used and accepted erasers for paper conservation. In addition, they have been the most thoroughly researched at the time of this publication. Specific products that are not included may be similar to those listed below. Please see the partially annotated bibliography at the end of the chapter for specific tests undertaken, list of erasers, paper samples, etc. Most of the products listed can be purchased in art or office supply stores or from conservation supply catalogs.

Chemical composition of proprietary products can change without notice from the manufacturer. Therefore, the specific major components, presence and amount of abrasives and trace elements, and subsequently, the working properties of a product may change. Some products have limited shelf lives.

When undertaking surface cleaning treatment, the type of eraser and method of application should be carefully chosen, with the following considerations: nature of the artifact, type of dirt to be removed, primary eraser component and abrasive content, product form (block, grated, powdered) and potential damage from eraser residues.

A. **General Information** (See 14.3.1.B, C, D, and E, for specific physical forms and products)

This section gives general information about polyvinyl chlorides, factice and rubber erasers, arranged by chemical composition.

1. Polyvinyl Chloride (PVC)

a. General Description and Composition: PVC-based erasers, often called vinyl erasers, tend to be white in color, and can be purchased in block or powdered form. Major components are polyvinyl chloride, phthalate plasticizer, and calcium carbonate.

b. Chemical Interactions/Residues/Aging Factors: PVC-based materials produce hydrogen chloride on aging. However, all PVC based erasers analyzed contain enough calcium carbonate to theoretically neutralize at least some of the acid produced until the carbonate is exhausted. (Moffatt 1981; Hueber 1985).

Questions have been raised about the effects of plasticizers present in PVC eraser residue on paper artifacts. The plasticizers are known to migrate into and interact with adjacent materials. For example, vinyl erasers left in contact with pencils have caused softening of the paint coating on the exterior casing of the pencil. This plasticizing effect of vinyl erasers can be used to soften and remove pressure-sensitive tape residues. (KN) Additionally, there has been concern about the effect of plasticizers on media, in particular printed or painted media. Another potential problem is the solubility of the plasticizer in polar solvents, such as alcohol, used in treatments after surface cleaning. (Moffatt 1981)

Some artifacts may be sensitive to sulfur or chlorine (e.g., silver-based photographs). Sulfur is not included in the manufacture of PVC erasers. PVC erasers release less chlorine than do rubber dry cleaning products. Chloride is tightly bound in PVC molecules and is not easily released. (Moffatt 1981, p. 5)

There appeared to be no significant difference between PVC or factice (vulcanized vegetable oil)

block erasers in the amount of residue left on paper. (Moffatt 1981, p. 6)

2. Factice (Vulcanized Vegetable Oil)

a. General Description and Composition: Factice-based erasers can be purchased in block and powdered forms with various working characteristics. Factice is vegetable oil which is vulcanized, i.e., cross-linked with sulfur bonds. The vulcanization process forms cross-links between the long polymer chains of oil, resulting in a dark, elastic product. Other materials are frequently added to enhance its properties (e.g., antioxidants to retard degradation). (Estabrook 1989, p. 82)

b. Chemical Interactions/Residues/Aging Factors: Factice-based materials deteriorate by additional cross-linking, even at room temperatures, causing an increase in hardness, but not generally creating harmful by-products. However, the possibility of particles becoming hard enough to cause abrasion of the paper surface has not been investigated. (Moffatt 1981, p. 4)

Chlorine and sulfur are both present in factice erasers. Chloride can be extracted into aqueous solution from factice erasers. To monitor the release of sulfur, a test was devised by the Canadian Conservation Institute to observe the degree of tarnishing on a silver coupon in contact with eraser samples. Factice erasers caused more tarnishing than PVC erasers. This is probably due to free sulfur remaining in the matrix after the vulcanization process. These results should be taken into account when treating chloride or sulfur sensitive artifacts. (Moffatt 1981, p. 5)

No difference was noted between factice and PVC block erasers in amount of residue left in paper. (Moffatt 1981 p. 6)

3. **Rubber**

a. General Description and Composition: Rubber erasers can be purchased in various forms, one of the most popular being the kneaded eraser. Rubber-based erasers are usually prepared by combining rubber, drying oils, abrasives and sulfur. The mixture is processed and vulcanized (i.e., cross-linked with sulfur bonds). (Moffatt, p. 4) Natural rubbers are polyisoprene polymers, predominantly cis-1,4-polyisoprene. Vulcanized rubber is made by cross-linking natural rubber, usually with sulfur. The amount of cross-linking is slight for soft solids such as erasers. Large quantities of sulfur increase strength and rigidity of the final product. (Horie 1987, pp. 89-91)

b. Chemical Interactions/Residues/Aging Factors: Rubber-based materials deteriorate by additional cross-linking, even at room temperatures, causing an increase in hardness, but not generally creating harmful by-products. However, the possibility of particles becoming hard enough to cause abrasion to paper was not investigated (Moffatt 1981, p. 4).

B. **Block Erasers By Product Name** (including eraser pencils and stick refills)

1. **Polyvinyl Chloride (PVC) Based Materials**
(See 14.3.1.A.1 for general information on PVC.)

a. **Magic Rub No. 1954** (Faber Castell Corp.)
White block eraser.

1.) Chemical composition: PVC, calcium carbonate, and phthalate plasticizer (dioctyl phthlate reported by Hueber and Pearlstein, dialkyl phthalate by CCI). Tests indicate presence of chlorine and trace of silicon. Relative amount of tarnish is intermediate. (See annotated bibliography under CCI ARS 1738 for description of test used to determine release of sulfur by eraser

products.) The pH of aqueous extract is basic. (CCI ARS 1738.6) Contains the abrasive limestone (calcite) and a trace of quartz sand. (McCrone 1966)

2.) Abrasion/Mechanical Properties: Magic Rub block was least altering to paper of four erasers tested. (Pearlstein, 1982. Article also stated that papers exhibited negligible abrasion and color change.) Moderately abrasive to polyester film (Mylar) compared to other products tested (Hueber 1985).

3.) Chemical Interactions/Residues/Aging Factors: No change in either surface pH or wetting ability after treatment of sample papers with Magic Rub. (Pearlstein 1982). No change in color noted in aged paper samples treated with Magic Rub compared to unaged samples (McCrone 1966)

In testing of eraser materials on cotton duck, moderate amount of crumbs (small, rounded white particles invisible to the unaided eye) remained on vacuumed fabric samples; crumbs were slightly resistant to removal by brushing, and did not discolor upon aging. Caused moderate color change and decrease in brightness of fabric samples compared to other erasers tested. (Estabrook 1989, pp. 86, 94)

After accelerated aging of eraser block, Magic Rub remained dimensionally stable; however, it became soft and sticky, warmer and grayer in appearance, emitted an odor, and decreased in surface pH (7.4 to 6.2). (Pearlstein 1982, p. 4)

4.) General Comments: Generally recommended by conservators and researchers, depending upon use and nature

of support. Good for hard-sized papers. Can use in solid or grated form; crumbs may offer more control and appear more gentle than block (WS). Because it contains abrasives, should not be used vigorously (Horton 1969). May be used to mechanically reduce pressure-sensitive tape adhesive residue. Eraser crumbs appear less tenacious than most others, and are removed easily from paper. (WS)

b. **Magic Rub Electric Eraser Refills** (A.W. Faber)
White eraser refill sticks.

1.) Chemical Composition: PVC, dialkyl phthalate, calcium carbonate, and silicate. Tests indicate presence of chlorine. pH of aqueous extract is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.10)

c. **Peel-Off Magic Rub No. 1960** (A.W. Faber)
White eraser in pencil form, encased in paper.

1.) Chemical Composition: PVC, dialkyl phthalate, calcium carbonate, and silicate. Tests indicate presence of chlorine and trace of silicon. The pH of aqueous extract is basic. Relative amount of tarnish is intermediate. (CCI ARS 1738.1)

2.) Abrasion/Mechanical Properties: Caused slight abrasion to polyester film (Mylar) compared to other dry cleaning products tested. (Hueber 1985) Is harder than block Magic Rub (WS).

d. **Mars Plastic 52650 and 52652**
(Staedtler, Inc.)
White block eraser.

1.) Chemical Composition: PVC, calcium carbonate, and phthalate plasticizer (dioctyl

phthalate reported by Hueber, dialkyl phthalate by CCI). Analytical tests indicate chlorine and possibly a trace of titanium. pH of aqueous extracts is basic. Relative amount of tarnish was slight (CCI ARS 1738.8).

2.) Abrasion/Mechanical Properties: Unsized papers treated with Mars Plastic did suffer some fiber damage, but sized paper was not noticeably affected (McInnis). Moderately abrasive to polyester film (Mylar) compared to other products tested. (Hueber 1985)

3.) Chemical Interactions/Residues/Aging Factors: Eraser crumbs remained visible in paper samples after treatment with Mars Plastic as seen in scanning electron microscope (SEM) photographs. (McInnis 1980)

In tests of eraser materials on cotton duck, few crumbs (very tiny, white invisible to the unaided eye) remained on vacuumed samples. Persistent brushing was necessary to remove crumbs, due to their quantity and location. Caused moderate color change and decrease in brightness of fabric samples compared to other erasers tested. (Estabrook 1989, pp. 82, 94)

4.) General Comments: Generally recommended by conservators and researchers, depending upon use and nature of support. Has similar characteristics and working properties as Magic Rub.

e. **Mars Eraser Refills** (Staedtler, Inc.)
White eraser refill sticks.

1.) Chemical Composition: PVC, dioctyl phthalate, calcium carbonate filler. pH of aqueous extract is basic (Hueber 1985).

2.) Abrasion/Mechanical Properties: Caused slight abrasion to polyester film (Mylar) compared to other dry cleaning materials. (Hueber 1985).

f. **Koh-i-lar 286** (Koh-i-noor Rapidograph, Inc.) White block eraser.

1.) Chemical Composition: PVC, dialkyl phthalate plasticizer and calcium carbonate. Analytical tests indicate the presence of chlorine and possibly titanium. The pH of aqueous extract is basic. No evidence of tarnish. (CCI ARS 1738.7)

2.) Abrasion/Mechanical Properties: Caused slight abrasion to polyester film (Mylar) compared to other erasers tested. (Hueber 1985)

3.) General Comments: Can be used with 291-F Koh-i-lar Liquid Eraser to remove pencil and ink from polyester-based drafting film.

g. **Vinyl block erasers with erasing fluids** (Faber-Castell TGK 7092 India Ink Eraser, Staedtler Mars Techniplast 526-58T): organic solvent incorporated into eraser to remove ink from polyester film and modern tracing papers.

2. **Factice-based Materials** (See 14.3.1.A.2 for general information concerning factice.)

a. **Art Gum** (Faber Castell Corp.) Tan block eraser.

1.) Chemical Composition: Pearlstein (1982) identified Art Gum 100 as factice (vulcanized vegetable oil). Faber Castell stated in personal correspondence (1991) that Design Artgum is a "polyvinyl compound loaded with factice; a sulfur free, non-abrasive plastic."

2.) Abrasion/Mechanical Properties: Both sized and unsized papers, treated with a similar gum eraser (AKA Art Eraser 430), exhibited fiber damage to a greater extent than samples treated with Mars Plastic or powdered eraser; samples exhibited extensive abrasion of fibers in SEM photographs. (McInnis 1980)

3.) Chemical Interactions/Residues/Aging Factors: No change in color noted between aged and unaged paper samples treated with Art Gum. (McCrone 1966)

Papers treated with a similar gum eraser (AKA Art Eraser 430) left residues in both sized and unsized samples. (McInnis 1980)

In testing of eraser materials on cotton duck, many crumbs (small, pale yellow, and difficult to see even with magnification) remained on fabric after vacuuming and were found deep in the weave rather than in the protruding fibers. Crumbs were easily removed by further vacuuming or brushing. Crumbs darkened with age. Caused little color change and dulling of fabric samples compared to other erasers tested. (Estabrook 1989, pp. 82, 93)

After accelerated aging of Art Gum, the eraser block decreased in weight and volume, exhibited an extreme color change, and emitted a pungent odor. The pH increased slightly (pH 6.6 to 6.8). (Pearlstein 1982, p. 4)

4.) General Comments: Generally recommended in solid or grated form dependent upon use and nature of support. As they tend to harden with age, these erasers should be used only as long as they

are soft and the particles or crumbs are also soft. (SB) In block form, gum erasers are less easy to control than vinyl erasers, as they crumble more with the same pressure. Often appears more abrasive than vinyl erasers. (WS) When crumbed, appears to be less efficient than vinyl erasers, but causes less damage to frail paper than vinyl erasers. Seems to perform best on a light layer of dirt; however, grated vinyl eraser worked more efficiently at the same task. Crumbly nature discourages precision work. (WS)

b. **Star Gum Cleaner** (Eberhard Faber)
Tan block eraser

1.) Chemical Composition: Factice and calcium carbonate. Tests indicate presence of chlorine, sulfur and traces of magnesium and iron. pH of aqueous extract is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.5) Does not contain added color.

2.) Abrasion/Mechanical Properties: Star Gum is one of the two least abrasive factice block erasers tested.

c. **Pink Pearl 101** (Eberhard Faber)
Pink block eraser.

1.) Chemical Composition: Factice, calcium carbonate, and trace of silicate. Tests indicate presence of chlorine, sulphur, magnesium, traces of iron, aluminum and potassium and possibly titanium. pH of aqueous solution is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.4). Plasticized with a hydrocarbon oil. Pearlstein lists the ingredients as factice, rubber, antioxidants, softeners, pumice and coloring agents. Inclusion of pumice

(silicon oxide and aluminum oxide) probably acts as a filler, absorbent, and adherent for rubber products (Estabrook 1989). According to McCrone, Pink Pearl contains the abrasive limestone (calcite) and a trace of quartz sand. Colorant present. (JM)

2.) Abrasion/Mechanical Properties: Readily abraded paper surface, and altered texture of test paper (Pearlstein 1982). Caused severe abrasion to polyester film (Mylar) compared to other dry cleaning products (Hueber 1985). Other pink block erasers may also leave pink marks on paper supports.

3.) Chemical Interactions/Residues/Aging Factors: Crumbs hung tenaciously to paper and were the most difficult to remove of erasers tested. Eraser altered the paper color. Papers treated with Pink Pearl were the most resistant to wetting (Pearlstein 1982).

In tests of eraser materials on cotton duck, an abundant number of crumbs remained on vacuumed samples; crumbs became darker and more yellow with age. Crumbs were visible in both weave and fibers. Not all crumbs could be removed even with aggressive brushing. Caused great color change and decrease in brightness of fabric samples compared with other erasers tested (Estabrook 1989, pp. 82, 93)

After accelerated aging of Pink Pearl, the block eraser emitted a rubber odor, lost 2 percent weight but gained 23 percent in volume, grayed slightly, became granular in appearance, and exhibited an increase in pH (pH 8.1 to 9.0) (Pearlstein 1982, p. 4)

4.) General Comments: Pink Pearl is not recommended by Pearlstein and some paper conservators due to its abrasive nature and the possibility of it altering the paper's color. However, it has been recommended by Horton and Clapp. Difficult to remove residues. Extreme pressure leaves pink mark. (WS)

d. **Rubkleen 6002** (Eberhard Faber)
Green block eraser.

1.) Chemical Composition: Factice, calcium carbonate and a trace of silicate. Tests indicate presence of chlorine, sulfur, titanium and traces of magnesium and iron. pH of aqueous solution is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.3) Colorant present.

2.) Abrasion/Mechanical Properties: Rubkleen was one of the two least abrasive factice block erasers tested by CCI. If transfer of color is likely to be a problem, an uncolored product may be preferable. (CCI ARS 1738) Caused severe abrasion to polyester film (Mylar) compared to other dry cleaning products. (Hueber 1985)

3. **Rubber Containing Materials**
(See 14.3.1.A.3 for general information on rubber)

a. **Wishab** (manufactured by AKA Chemie, West Germany, distributed by Talas)

Two part eraser: one side is a yellow sponge-like pad and the other is a blue, stiff foam abrasive. Only the yellow side has been used to clean paper.

1.) Chemical Composition: Yellow part is a synthetic rubber, a styrene-butadiene

copolymer. Elemental analysis reveals the presence of chlorine. An unidentified sticky yellow component was extracted. (CCI ARS 2688)

2.) Chemical Interactions/Residues/Aging Factors: Size of crumbs can vary.(FZ) Crumbs are very small and pale when fresh; darken to deep orange upon aging. Bristle brush easily dislodges crumbs from cotton duck. Little color change and loss of brightness of cotton duck samples treated with Tapeten Reininger compared to fabric treated with other eraser materials. (Estabrook 1989)

3.) General Comments: Not recommended for routine surface cleaning of paper materials due to results of analytical testing (CCI ARS 2688). Advertised by Talas as removing dust, soot, etc., but not oil and grease.

b. **Smoke-off Sponge** (manufactured by Maritime Chemicals and Equipment Limited) Synthetic sponge.

1.) Chemical Composition: Mainly composed of cis-1, 4-polyisoprene rubber heavily filled with calcium carbonate. Small amount of hydrocarbon oil extracted from product during testing. Tests indicate minor occurrence of sodium, silicon, sulfur, and zinc. (CCI ARS 2445)

2.) General Comments: Similar products (Wallmaster Drychem Sponge) have been used to remove dirt and soot from fire-damaged surfaces. Tend to be soft and pick up soil readily. Can be cut into smaller shapes. Can be washed, but begin to crumble after awhile. (Mowery 1991)

C. Powdered Erasers

1. Loose Eraser Crumbs/Powders

a. **Dandy Rub Powder 7025** (Faber Castell)
Green powdered eraser.

1.) Chemical Composition: Factice, calcium carbonate, and silicate. Analytical tests indicate the presence of magnesium, chlorine, sulphur, and possibly a trace of zinc. The pH of aqueous solution is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.12)

b. **Skum-X Powder 140C** (Patent 2305910, Dietzgen)
Beige powdered eraser.

1.) Chemical Composition: Polyhydrocarbon rubber and calcium carbonate. Analytical tests indicate the presence of sulfur, possibly chlorine, and possibly traces of aluminum, titanium, silicon, and zinc. The pH of aqueous solution is basic. Relative amount of tarnish is very heavy (CCI ARS 1738.11).

2.) Chemical Interactions/Residues/Aging Factors: Skum-X left by far the least amount of residue of the two loose powdered erasers tested by CCI, and was the only powder not containing silicates.

3.) General Comments: Skum-X is also available in pad form.

2. Eraser Pads
Powdered eraser is packed in a fabric bag or pouch which can be lightly compressed to release crumbs or applied directly to the artifact's surface. Magnesium silicate is added to dry cleaning pads to facilitate the movement of eraser crumbs through the pores of the bag. (Pearlstein,

p.3) Pad erasers, which let through mainly the finest eraser dust, leave the most residue embedded in paper fibers of all erasers tested by CCI. (Moffatt 1981) Some conservators recommend removing the powder from the bag and working on the paper's surface with brushes. Pads may retain finger oils and dirt from constant use and may redistribute dirt. Pads are difficult to see around while working. May scratch glazed papers. Due to size of pad, one inevitably cleans a larger area than needed. Fine crumbs are difficult to remove. (WS)

a. **Magic Pad M1965** (Faber Castell)
White powdered eraser in fabric pad.

1.) Chemical Composition: PVC, dialkyl phthalate plasticizer, calcium carbonate, and a silicate. Analytical tests indicate the presence of magnesium, chlorine, and traces of sulfur and iron, and possibly traces of zinc and titanium. The pH of aqueous extract is basic. Relative amount of tarnish is heavy. (CCI ARS 1738.13)

2.) General Comments: Leaves tiny residual particles that are difficult to remove; some conservators prefer grated vinyl eraser.

b. **Mars Pad** (Staedtler, Inc.)
White powdered eraser in fabric pad.

1.) Chemical Composition: Staedtler states that Mars Pad contains vinyl eraser crumbs (personal correspondence 1992). However, Hueber found that the eraser was composed of factice (vulcanized vegetable oil) and calcium carbonate filler, and contained sulfur. The pH of aqueous extract is basic (Hueber 1985).

c. **Opaline Pad** (Durasol Chemical Company)
White powdered eraser in fabric pad.

14. Surface Cleaning, p. 20

1.) Chemical Composition: Factice, calcium carbonate, and silicate. Analytical tests indicate presence of magnesium, chlorine, sulfur and possibly a trace of zinc. pH of aqueous extract is basic. Relative amount of tarnish is very heavy. (CCI ARS 1738.14) Factice (vulcanized vegetable oil) and magnesium silicate. (Pearlstein 1982)

2.) Abrasion/Mechanical Properties: Least abrasive dry cleaning product tested by Pearlstein; less abrasive than Magic Rub block eraser. In tests using a similar product (Draftsman's ABC Cleaning Pad by Keuffel and Esser Co.), papers treated with dry cleaning powder did not appear abraded. (Powder was worked onto the surface of the paper using bristle and sable brushes. (McInnis 1980).

3.) Chemical Interactions/Residues/Aging Factors: Surface pH of Opaline-treated papers increased; color of the paper surface became warmer in appearance after treatment and aging, possibly due to color change in eraser crumb residue (Pearlstein 1982). However, McCrone noted no change in color in aged paper samples treated with Opaline Pad compared to unaged samples. Pearlstein also observed that samples treated with the Opaline Pad required the most brushing to remove the visible eraser crumbs.

In tests using a similar product, eraser residue remained in paper in greater amounts than papers treated with other erasers. (McInnis 1980).

4.) General Comments: Leaves tiny residual particles that are difficult to remove; some conservators prefer grated vinyl eraser.

D. Kneaded Erasers

1. Rubber-Based Materials

Assessments of the abrasiveness of kneaded rubber vary from very gentle (Banks) to abrasive (McInnis 1980). If used improperly, kneaded rubber erasers have the potential to cause great damage as they pull away surface fibers; however, they can create minimal damage if used gently (Moffatt 1981, p. 5). Kneaded rubber erasers may deposit a film; this occurs as the eraser (which has begun to deteriorate with age and use) is kneaded and becomes slightly sticky. (BMH)

a. Kneaded Rubber 1224 (Eberhard Faber)
Grey kneadable eraser square.

1.) Chemical Composition: Polyisobutene and calcium carbonate. Analytical tests indicate the presence of chlorine, sulfur, titanium, and traces of magnesium, aluminum, silicon and potassium. The pH of aqueous extract is basic. Relative amount of tarnish is very heavy (CCI ARS 1738.16). Manufacturer identifies the composition as polyisobutene and calcium carbonate or natural and synthetic rubbers, vegetable oil, mineral oil, antioxidants, pumice, calcium carbonate, and titanium dioxide. Pearlstein includes carbon black as an ingredient. The mineral oil acts as a softener to prevent curing (Pearlstein 1982, p. 3).

2.) Abrasion/Mechanical Properties: Pearlstein stated that the kneaded eraser abraded paper fibers to a greater extent than block or powdered erasers. Very slight abrasion to polyester film (Mylar) compared to other erasers, but left a gummy residue (Hueber 1985).

3.) Chemical Interactions/Residues/Aging Factors: Did leave some particles on test

papers (Moffatt 1981). Crumbs, not visible to the unaided eye, were difficult to remove (Pearlstein 1982).

Surface of paper samples treated with kneaded eraser had a slightly dirty appearance after accelerated aging. Also exhibited a resistance to wetting with water; however, the surface pH of the paper was unaffected by treatment (Pearlstein 1982).

In testing eraser materials on cotton duck, no crumbs (tiny, white, invisible to unaided eye) were visible on vacuumed fabric samples; most crumbs were located in the weave and easily brushed away. Fabric samples exhibited great changes in color and a decrease in brightness after treatment with kneaded eraser and subsequent aging compared to other erasers tested. (Estabrook 1989, p. 86, 91)

After accelerated aging of a kneaded eraser, the eraser lost weight and volume, emitted a rubber odor, and turned warmer in color and firmer in texture. (Pearlstein 1982)

4.) General Comments: Concern over the way kneaded rubber erasers retain and possibly redeposit surface dirt. When made into a point, may carefully remove grime from along long fibers with little disruption of the paper's surface. (WS)

b. **Groom Stick** (Talas)
Very sticky, beige kneadable eraser.

1.) Chemical Composition: Vulcanized cis - 1,4- polyisoprene rubber and titanium dioxide. Analytical tests indicate traces of aluminum, silicon, potassium, calcium,

iron, chlorine, and sulfur. The pH of aqueous extract is neutral. No tarnish (CCI ARS 1738.17)

2.) Abrasion/Mechanical Properties: Capable of tearing away many surface fibers when used aggressively due to its tacky nature (Moffatt 1981).

3.) Chemical Interactions/Residues/Aging Properties: Groom Stick leaves no detectable residue. (Moffatt 1981)

4.) General Comments: Has been helpful in getting accretions off mats, but may be much too strong to use on an artifact; seems to leave behind a residue. (KP)

2. **Starch-based Materials**

a. **Wallpaper Cleaner** (Sheffield)
Pink kneadable eraser.

1.) Chemical Composition: Starch and sodium chloride. Analytical tests indicate trace of aluminum. The pH of aqueous extract is acidic (CCI ARS 1738.18). Colorant present.

2.) Chemical Interactions/Residues/Aging Properties: Tended to fragment and left many sticky, pink particles which became hard and brittle on drying; potentially troublesome (Moffatt 1981).

b. **Absorene** (Absorene Mfg. Co.)
Pink kneadable eraser.

1.) Chemical Composition: Dried product composed mainly of starch, sodium chloride and sodium nitrate (CCI ARS 2376) Flour, salt, water, mineral spirits, possible aluminum (Estabrook 1989 p. 80).

pH of aqueous extract is acidic (3.8) (Hueber 1985). Colorant present.

2.) Abrasion/Mechanical Properties: Not abrasive to polyester film (Mylar). (Hueber 1985)

3.) Chemical Interactions/Residues/Aging Properties: Absorene has been used for the removal of dust from books and paper objects; however, the crumbs are difficult to remove when dried (Horton, Banks). McCrone emphasizes that Absorene is a wallpaper cleaner and not specifically recommended for book cleaning. When exposed to air, Absorene becomes hard, but it can be remoistened with water. (Moffatt 1981).

In tests done on cotton duck, many crumbs (small, pale pink, invisible to the unaided eye) remained on vacuumed fabric samples; crumbs easily disengaged from cotton fibers with several passes of a bristle brush. Fabric samples treated with Absorene exhibited little color change and loss of brightness after treatment and aging compared with other dry cleaning materials. (Estabrook 1989, pp. 86, 91)

4.) General Comments: Not generally accepted for routine cleaning of paper objects. Likely to contain dirt and oils picked up from fingers during use. (Moffatt 1981) Feels greasy; requires light pressure; otherwise, will split and crumble. (WS)

E. Other Surface Cleaning Materials

1. **Rubber Cement Pick-Up/Natural Rubber Pick-Up/Crepe Eraser**: (Distributed by Double E Distributing Co., Inc.; they obtain the product from Ramco Trading Corp.) Made from natural latex from which the liquid has

been removed during a coagulation process. Formic acid is used to remove carotene materials. The latex is then sheeted-out and die cut. Information obtained from Jeff Herring, Ramco Trading Corp., and Paul Hurley of the Malaysian Rubber Bureau. Used in paper conservation primarily for the reduction of pressure-sensitive tape adhesive from paper, but could be quite useful for certain types of extraneous materials. (See AIC/BPG/PCC 15. Hinge, Tape and Adhesive Removal.)

2. **Silly Putty**: Not recommended for surface cleaning of paper artifacts, but its peculiar properties may be of some use in special circumstances. Can pick up printing inks from some surfaces such as newspaper printed with oil-based ink. If left to sit on paper surface, can flow into the fibers, becoming impossible to remove. Contains silicone, with presence of titanium and traces of iron and chlorine. (CCI ARS 1738.19) Colorant present. Oily nature.

3. **Bread**: Bread has been historically used as a surface cleaning material, but is no longer in general use. Bread should be baked without oils, yeast, or (potentially abrasive) salt. (SD) Traditionally, day old bread was preferred, as it was not as moist as fresh bread and may have had "tooth" to facilitate better cleaning. Crusts were removed and the bread was pressed into the paper surface with a rolling motion. (EO) Residual bread may support mold growth. (RA)

4. **Pressure-Sensitive Tape**: Masking tape, (or other pressure-sensitive tapes) wrapped around a wooden stick (pointed or blunt) can be useful in picking up pressure-sensitive tape residues or extraneous materials in small areas, especially when adhesive has been softened with a solvent chamber.

5. **Erasing Fluids** (291-F Koh-i-lar Liquid Eraser, etc.): Advertised as a non-flammable liquid eraser used to remove ink lines from polyester-based drafting film; used in conjunction with white vinyl erasers (Koh-i-lar 286).

14.3.2 Application Accessories

A. Air: air blower bulbs, aspirators (compressors), pressurized air cans (e.g., Dust Off), vacuum cleaners (Dustbusters, Minivacs, low pressure vacuums), vacuum tweezers.

Pressurized air cans are ozone depleting. They can also contain a dark, oily substance that may be sprayed onto the artifact. (NP)

Cheese cloth or another porous fabric should be attached over vacuum cleaner nozzles to guard against accidental vacuuming of artifact fragments. The cloth should be changed regularly to avoid accumulations of dirt and grime. (SD)

B. Brushes: all sizes of soft hair or synthetic brushes, bristle brushes, "bench brushes." Designate brushes to be used specifically for surface cleaning. (NN)

Brushes may be used with static charge by rubbing the hairs against synthetic, nylon, or wool fabric. (JK)

Hard bristle brushes should be used with care so that paper fibers and media are not disrupted. "Bench brushes" should not be used directly on object surfaces because the hard bristles may scratch the media or paper surface. (SD)

C. Mechanical Removal Tools: scalpels, tweezers, spatulas, needles, wood and metal probes, cotton swabs and pads (dry and dampened).

D. Graters: regular and rotary cheese graters, meat grinders, ceramic and plastic vegetable graters, blenders, electric spice mills, and coffee mills.

Only good quality stainless steel graters should be used. Lesser quality metal graters contaminate the eraser crumbs with potentially harmful particulates as well as possibly discoloring the crumbs, thereby making it more difficult to distinguish fresh and used eraser. Fineness or coarseness of the grater's surface contributes to the size of eraser particles created. This particle size should be varied depending on the surface quality of the paper being cleaned. (BMH)

Metal blades in food processors, blenders, spice and coffee mills will dull rapidly when chopping erasers. This type of grating may also result in uneven particle sizes and irregular eraser chunks. (SD)

Graters should not be used for other materials which may introduce new sources of contaminants (SW).

E. Eraser stick Holder: plastic or metal adjustable holders, wrapped eraser sticks. Erasers on the end of pencils are not recommended.

F. Electric Eraser Tools, and a variety of eraser sticks: Electric erasers may be difficult to control and may be too abrasive if used incorrectly. (MF)

G. Cotton and Latex Gloves

H. Blotting Paper

I. Weights

J. Pads and Pillows for Supports

K. Mylar and Paper Shields: Mylar and paper shields can be used to protect tear edges and/or media. See section 14.4.3 Additional Surface Cleaning Techniques, below.

L. Suction Tables: Suction tables can be used to hold fragile, dense-fibered papers in place for surface cleaning. The suction table should be used in a clean environment and with the lowest possible vacuum to avoid pulling in airborne dirt, pollutants, and eraser particles. (SD, EKS, RA)

M. Book Cradles

N. Microscopes

14.4 Treatment Variations

14.4.1 Preparation of Materials

A. Grating of erasers: Block erasers (e.g., vinyl and rubber) can be converted to crumbs using one of the above-mentioned graters. Some conservators prefer metal grinders to produce larger quantities of eraser crumbs. Metallic particles may be produced when a new metal grater is initially used. Other conservators prefer ceramic or plastic graters rather than metal ones to avoid metallic particles in the eraser crumbs.

B. Cutting/shaping of erasers: Block erasers can be cut into a wide variety of shapes and sizes to suit the needs of a particular treatment. Thin slivers or wedges of white vinyl eraser can be especially useful for cleaning close to media lines. Because slivers are lightweight, they pick up less dirt initially than blocks, and are thus more controllable. Pencil-shaped erasers can be cut to a fine point.

In addition, new block erasers can be grated on the large flat surface, and then cut into triangular pieces. The surface, which now has a slight tooth as a result of being roughened against the grater, can serve to gently manipulate loose eraser particles across the paper surface. There is no finger pressure being applied to move the crumbs; rather, they cling to the grated surface of the cut eraser, and can be rotated lightly accommodating any variation in the paper surface.

C. Eraser pads: Can be shaken to release the fine eraser powder. Direct application of pads should be done with care.

14.4.2 A Basic Surface Cleaning Procedure

Surface cleaning should generally precede other treatment steps, especially aqueous or organic solvent treatments that may cause the dirt to become irreversibly embedded in the paper fibers. Tidelines and testing rings can occur when solvent testing proceeds without first removing surface grime. Also, handling soiled paper can transfer dirt and create additional fingerprinting.

A. Determination of need for surface cleaning:
Carefully examine the object support, media, and type of surface dirt to determine the need for surface cleaning. The curator or custodian should be consulted regarding surface dirt that may provide historic or provenance-related information.

B. Examination and testing: Perform pre-treatment examination both with and without a binocular microscope to determine if surface cleaning is safely possible. Magnification can show disruption of fibers not otherwise noticeable. Observe in normal and raking lights. Raking light can reveal changes in surface characteristics such as marring, dulling, or increased sheen. Test a very small and discrete area on the support reverse or non-image margins to determine the best possible eraser type and application procedure. One often needs to test more than one area to determine where dirt can easily be removed, versus where it may be ingrained (e.g., hinge areas, areas of abrasion, etc.) (KB) The testing should be done very carefully.

Testing should determine the physical limitations of the paper (e.g., stress to the support, surface alterations) and potential damage to the media. Testing can also determine a potential range of treatment results to aid the conservator and the custodian in deciding on the desired extent or results of this treatment step.

It is important to avoid applying only one particular dry cleaning material or method of application to all types of paper artifacts, even if the media and support seem to be very similar. Thorough physical testing of superficial dirt should always be performed. (JM)

There is the potential for uneven cleaning and over-cleaning areas that may contrast with ingrained dirt, or dirt adjacent to media and inscriptions. Dirt may disguise a mottled or unevenly discolored sheet, and may hide heavily degraded areas such as found along edges. (KB) Foxing spots and other stains may increase in visibility after surface cleaning. (KP) Surface cleaning a really dirty object may change the tonality of the sheet from a cooler grey to a warmer brown. (KB)

C. Preparation of work area: Prepare a clean work surface. Most conservators use white blotters and/or glassine (with white blotter or board underneath) under flat paper artifacts. Books should be cleaned on a cradle or supporting pillows or pads. Working on a light colored surface will help to monitor how dirty the eraser crumbs become. The work surface should be regularly brushed off or changed to keep the area free of contaminated eraser particles. A smooth glassine sheet or

silicone release paper may help to facilitate the removal of eraser crumbs.

A lightweight folder can be placed under the artifact when cleaning with eraser crumbs. Crumbs can then be moved towards the crease and disposed of more neatly. (RF)

Place the artifact on the work surface, and secure with blotter squares, weights, and glass, or other materials. If the conservator's hand is used to hold the artifact in place, it should rest on top of a blotter or a cotton glove can be worn. If both sides of the artifact are to be cleaned, clean the front first. This will avoid the smudging of dirt particles on the front. (RA)

D. Air and brushes: If appropriate, loose and superficial dirt may be reduced by blowing with an air blower bulb, pressurized air can, or very soft brush. Care should be taken when using this technique on soft papers: fibers may be disrupted and dirt may not be effectively removed. (NP, SD) This technique should not be used with friable or powdery media.

Aspirators can be used to reduce heavy accumulations of surface dirt and mold from paper surfaces.

Surface cleaning materials and tools should be manipulated from the center (avoiding media) towards the perimeter of the paper and along (rather than across) tears to avoid extending them.

E. Powdered or Grated Erasers: Further surface cleaning can be done with eraser powders or crumbs, lightly applied and manipulated in a circular motion with a brush, flat side of a block eraser, small pieces of paper/Mylar, or finger tips. Even the most clean hands may contain oil and dirt, to be transferred onto paper. The use of clean gloves, cotton and otherwise, may be advisable. (JM) However, cotton gloves may hinder the conservator's sensitivity, making it difficult to feel the eraser crumbs. Mylar can be used as a barrier between fingers and eraser crumbs to protect fingers from becoming abraded during large cleaning jobs and to help prevent fingers from catching on edge tears. (MF) For more deeply embedded dirt, additional

pressure may be applied to the eraser powder or crumbs in non-image areas.

Circular motion with eraser crumbs tends to increase their ease of removal due to a tendency to gather together into larger masses. (WS) Discard used crumbs as they become soiled, as reusing crumbs could transfer dirt. (BMH) Avoid getting crumbs caught underneath the object.

Soft ArtGum crumbs may pick up and hold more surface dirt than hard vinyl eraser crumbs. (MF)

F. Block erasers: For embedded dirt, soil, or grime, solid blocks can be used. The block should be manipulated with careful motions. Some conservators prefer circular rather than a back-and-forth motions to avoid "setting in" a dirt pattern. (CB, WS) On a very soiled object, the eraser material may have to be manipulated in a series of circular patterns followed by either a vertical or horizontal action. (ECW) Be particularly careful at corners, which are often damaged, and creased areas; work inward from the corner. (DvdR)

The end of vinyl erasers can be grated to create a rough surface. This seems to reduce abrasive and rubbing action of eraser on delicate and finished paper surfaces. (YS)

G. Localized cleaning: Local cleaning of dirt may be undertaken with eraser sticks, kneaded erasers, etc. Care should be taken not to over-clean a specific area.

Kneaded rubber erasers can be softened a bit in one's hand, fashioned into a point, and used with a vertical dabbing and lifting motion to reduce discrete smudges. (NA)

If a pronounced line is produced between an area surface cleaned with a block eraser and an area that cannot be surface cleaned, the transitional line can be reduced with grated eraser.

H. Damaged supports: Surface cleaning on damaged papers should be undertaken with proper precautions. Mylar or blotter shields can be used in several ways to protect the object:

When working over especially dirty tears, it is beneficial to use a small piece of Mylar as an eraser guard. Mylar is placed under the side of the tear to be cleaned and over the opposite side of the tear. An eraser pencil or sliver can then be used to clean the dirty tear edge in the direction of the fibers. The Mylar prevents abrasion of the fibers on the opposite edge. Both edges can be cleaned in this manner. This technique will diminish the "dirty line" look of a mended tear. (ECW, LOP)

14.4.3 Additional Surface Cleaning Techniques

A. Flat Paper

1. Removal of accretions: Insect accretions on very soft papers can be problematic. They can be removed with a needle, microspatula, or scalpel tip, sometimes under magnification. To minimize fiber disruption, it may be easier to remove accretions from a soft-fibered paper with a soft brush when it is damp. (ECW)

   Picking off accretions with a scalpel may disturb the paper more than fracturing the accretion with the tip of a scalpel. Light downward pressure on the accretion may cause it to fall apart and allow the residue to be more gently brushed or scraped away. (NA)

   Surface dirt or non-adhered accretions can be picked off friable media with a 0-000 sized brush, or a small piece of kneaded eraser or pressure-sensitive tape (adhesive side out) on the end of a probe. Care must be taken to touch only the accretion and avoid the media. It is helpful to use magnification and to steady the hand on a support. (EKS) A kneaded eraser has been used to pick off glass shards. (RF) Be careful with fingers and discard eraser afterwards.

2. Working around media: To blend surface cleaned areas into areas that cannot be cleaned (i.e., smudged friable

medias), a swab can be used to manipulate eraser crumbs towards the image. The pressure on the swab should be significantly decreased as it nears the image. It is preferable to use a soft brush outside the image area. Friable media should not be touched with eraser materials or tools. (SD)

When surface cleaning a graphite drawing, the conservator should "feather" in towards the design lines to minimize haloing around the graphite lines. A protective overlay of Mylar may be used to help clean closer to the graphite line. The possibility of creating halos and the ability to limit them should be carefully considered before undertaking treatment. (Similar consideration should be given to chalk, and/or charcoal drawings.) (NA)

When hard graphite lines are present (particularly in architectural working drawings) and the legibility of the information may be more important than the subtle nuances of design line, the conservator may choose to surface clean over the graphite lines, usually with grated eraser, without apparent loss or alteration of media. (NA)

Kneaded erasers work well as a controllable method which does not involve scatter of crumbs. Kneaded erasers can be fashioned into fine points to work around design lines, or signatures. Use a gentle dabbing motion rather than back and forth movement. Use of a microscope can be helpful when working around media. (YS) Care should be taken to avoid halos around lines.

3. Embedded dirt: Dirt which is trapped or embedded in the paper's surface sometimes cannot be reduced with eraser materials. The following locally applied wet techniques can be used depending upon the nature of the paper and dirt:

Cotton swabs dampened with water or saliva can be rolled over local areas to lift off embedded dirt; best results tend to be on hard-sized papers. (KS)

Diluted solutions of methyl cellulose or other cellulose ethers can be manipulated gently with cotton pads, swabs, or brushes to loosen stubborn dirt. The methyl cellulose is then removed with dampened swabs or in a water bath. Surface grime has been removed from some photograph mounts using approximately 0.4% methyl cellulose solution and then sponging off the mount with water. (Kennedy 1988)

Enzymes in solution or poultice can be used to break up adhesives and other materials holding dirt. (DvdR)

Grime may be embedded or held in place by contact with pressure-sensitive tape adhesive. Reducing tape adhesive with organic solvents may release embedded grime, which can then be effectively reduced with surface cleaning.

B. Books

1. If the text block will remain bound, the binding should be properly supported so that its structure is not weakened by the process. (NN)

   If it is necessary to clean bound material, it is essential to have a supporting surface which is flexible, but also more rigid than museum board. A polypropylene support, of the thickness used for phase box buttons, is suitable. This can be readily slipped between leaves. The corners should be rounded to avoid potentially hazardous points which may catch the leaves. (BMH)

2. Before opening a volume, remove any surface dirt or residue from the head, tail and fore edge. Heavy accumulations of dirt on the head (top edge) of a book can first be cleaned with an untreated dust rag or low suction vacuum cleaner. (NN)

   Book edges can be cleaned with block erasers. The book should be held tightly shut to keep crumbs from entering the text block. This step should be undertaken prior to disbinding since it is

difficult to clean the actual edge of a disbound book leaf. (NN, MF)

3. Variation can occur within the text block paper so it is important to survey the paper quality and degree of absorbency throughout the volume. Pay special attention to the endleaves and title page, as well as any opening of the text block which has been more exposed to the environment. Generally, books have the advantage of being protected by closed covers some of the time. If the text block is compact as a result of good sewing, the likelihood of dirt settling on the interior surfaces of the leaves is reduced. (BMH)

4. Aspirators, blowers, and brushes can be used to clean book gutters. (SD, NN) Natural bristle brushes (or mixed bristle with the same "spring") can be used to flick off surface debris from the interior of the text. When working in a bound book, be sure to utilize an incline, and use a downward brush stroke away from the gutter. (BMH)

5. Cleaning pages of a bound book with any kind of crumbled or grated material should be avoided because it is very difficult to remove eraser crumbs from the gutter. If surface cleaning is undertaken, eraser particle residues should be considered to be in permanent contact with the artifact. (MF)

14.4.4 Eraser Crumb Removal

A. Air bulbs, pressurized cans, aspirators, vacuum cleaners, etc. Dental vacuums were found to be less effective at crumb removal than hoped. A vacuum strong enough to remove fine crumbs also drew the paper toward the vacuum. Was more effective on larger crumbs rather than small. (JK)

B. Various sized soft brushes. Japanese sheep hair brushes are especially useful in removing crumbs due to the soft hair and shape/construction of the brushes. (BMH)

C. Fingers (with cotton gloves).

D. Crumb catcher.

E. Mylar: To remove fine eraser particles or dust, rub a sheet of Mylar gently over the paper surface after most of the larger crumbs have been removed. (LOP) The dust will be attracted to the Mylar by static electricity. Mylar should not be used over friable, powdery, or sensitive media. (SD)

F. Other Erasers: Vinyl eraser crumbs can be picked up by kneaded erasers.

14.5 Special Considerations

14.5.1 Parchment and Vellum (J. Munn)

The surfaces of parchment and vellum skins are prepared to achieve specific characteristics; therefore, special attention to the effects of surface cleaning is necessary to avoid damaging or altering the surface of these skins. When the surface is hard and shiny, there is usually no problem with surface cleaning in the same manner as paper.

When the surface has been pumiced, the closed, glazed character becomes open and velvety because the fibers of the grain or flesh sides of the skin are now only attached on one end, creating a nappy texture. The abrasive nature of surface cleaning can be problematic by actually teasing the fibers away from the skin. It is also more difficult to remove eraser crumbs from the many fibers that make up the surface nap.

The surfaces of parchment and vellum skins may have been coated with a white substance such as gesso. Medieval parchment makers used a mixture of gypsum ($CaSO_4$) and chalk ($CaCO_3$) to coat the skins while drying, and scribes used the same mixture for illumination with egg tempera colors. Later documents were also prepared overall with a white ground. Careful examination under the microscope can help determine the suitability of dry cleaning these surfaces. A haloing effect around words may have been produced by a palimpsest [an original historic erasure made by scraping the surface of the skin to remove ink]; this haloing could be disturbed by surface cleaning.

Parchments can be surface cleaned with cotton swabs minimally dampened with ethanol:water (1:1). (ECW) This can remove shine, which may or may not be desirable. Also, damp cheese

cloth with a minute amount of Ivory Soap is sometimes used to surface clean parchment. The soap residue is cleaned away with damp cheesecloth. (SRA)

14.5.2 **Blueprints and Photo-Reproductions**

Blueprints are alkaline sensitive, and should not be surface cleaned with erasers that have an alkaline component or high pH. (LOP)

Some reproductive processes used for architectural and engineering drawings have silver-based images and should be treated with the same cautions as silver-based photographs. The most common of these are Vandyke or brown-prints. (LOP)

14.5.3 **Architectural Linens**

Embedded grime in architectural linens can be cleaned using cotton pads that have been very minimally dampened with ethanol. Use care around soluble inks. (SD) Use care with erasers before and after ethanol treatments due to possible solubility of some eraser components in organic solvents.

14.5.4 **Japanese Papers**

Dirt can sometimes be removed from Japanese papers by tapping its surface with a kneaded eraser, avoiding a rubbing motion that would tend to lift and abrade paper fibers. Stray offset ink marks sometimes found in Japanese woodblock prints can be reduced using the kneaded eraser with a rocking motion. (EC, from Keiko Keyes)

14.5.5 **Typing Papers**

Some typing papers may have a coating of gum arabic which allows erasures to be made easily. (Glicksman 1973, p. 253)

14.5.6 **Photographs (SW)**

In certain situations, the surface cleaning of photographs by dry removal methods is desirable. Dry surface cleaning methods are frequently performed on the verso of the photographic prints and follow procedures used for most paper objects. Surface cleaning may also be performed on the recto to reduce heavy amounts of surface soot and grime prior to wet/solvent treatments or to reduce contaminants which may cause fading or staining of the photograph. Surface cleaning methods are especially useful in

situations where the type of photographic process or its conditions precludes the use of moisture, solvents, or bathing.

There are several factors to consider when surface cleaning photographs or when choosing an eraser for surface cleaning:

1. The type of photographic process and the sensitivity of its final image material to chemicals found in the eraser materials.

   Photographs are inherently more sensitive to chemicals found in many eraser materials. Sulfur, chlorine, peroxides, oils, plasticizers, abrasives which may contain reactive metals (e.g., aluminum) are found in many erasers. Any of these contaminants may react with the final image materials to cause fading and/or image discoloration or to cause staining and other deleterious effects on binders, coatings, and paper supports.

   Metallic silver is the most common final image material and it is especially susceptible to oxidation by sulfur, chlorine, peroxides, reactive metals, and oil compounds. The danger is probably highest from eraser crumb residues left on the objects than from contact during dry cleaning. Little research has been done on the effects of dry cleaning on image stability.

   For this reason, it is best to use an eraser with low sulfur and chlorine content and which will cause the least amount of silver tarnishing. Many photographic conservators prefer Staedtler Mars Plastic (blocks) or Mars Eraser Refills (sticks) since neither contains sulfur.

   In order to avoid further contamination of the photograph with hand oils, grated eraser crumbs should be worked over the surface with a gloved hand or solid eraser. Crumbs and eraser residues should be carefully removed from the photograph.

2. The type of photographic process and the sensitivity of its surface to dulling, burnishing, abrasion, or staining from eraser materials.

As with all objects, the surface characteristics of photographs vary. Photographs with binders such as gelatin, albumen, or collodion prints may be glossy or mat to varying degrees. Print processes without binders may have image material embedded in the paper support on the surface (e.g. platinum, gum prints). Any process may be additionally coated with gum or wax.

Erasers may cause unintentional dulling of glossy surfaces and abrasion or burnishing on coated surfaces. Although surface cleaning might be desirable, the print should be evaluated for this sensitivity. Testing on a small area should be done along the photograph's edge to determine what changes may occur to the surface. Grated eraser may be more gentle than solid, especially when light pressure is applied.

There is a theoretical possibility that erasers containing plasticizers may soften binders and/or coatings on photographs. Collodion binders and varnish coatings are most susceptible. The danger is probably highest from eraser crumb residues left on the objects than from contact during dry cleaning. Little research has been done on the effects of dry cleaning on binder/coating stability.

3. Condition of binder or image-containing layer and whether surface cleaning is feasible.

Gelatin, albumen, and collodion photograph binders may have flaking and/or cracking. Print processes with binders or coatings may have silver mirroring which is susceptible to abrasion. Processes without true binders, such as gum prints, platinum prints, and cyanotypes may be friable.

The condition of the photograph may preclude the use of erasers. The use of erasers on flaking photographs should be avoided. Caution should be exercised around chipped edges that may worsen during cleaning. Heavily cracked photographs should be examined and tested carefully; eraser cleaning may dislodge cracked pieces of binder or embed crumbs and residues permanently into cracks. Eraser cleaning may remove silver mirroring unevenly,

resulting in a mottled surface (metallic image silver is removed in the process). Eraser cleaning of friable prints may not be feasible, except in non-image areas.

14.6 Partially Annotated Bibliography

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removal, etc. Products tested include: Absorene, Art Gum, Tapeten Reiniger (Wishab), Pink Pearl, Mars Plastic, Magic Rub and Kneaded Rubber.

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Determined chemical composition of dry cleaning products, pH of aqueous extract, sulfur and chlorine content, and tested for abrasiveness against polyester film (Mylar). Products tested: Opaline Pad, Mars Pad, Magic Rub, Mars Plastic, Rubkleen Eraser, Absorene, Skum-X, Kneaded Rubber, Koh-I-Lar Eraser, Peel-off Magic Rub, Mars Eraser Refill, Pink Pearl.

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McCrone, Walter and Assoc., "Report on Testing Block Cleaning Materials," Report to Library Technology Project No. 50, American Library Association, Chicago, 1966.

Examined dry cleaning products to determine if harmful residues were left in paper and book materials. Applied products to paper and then artifically aged samples. Samples tested for fold endurance, tear or chemical damage to fibers. Erasers tested: Pink Pearl 100, Art Gum, Magic Rub, Opaline Pad, Absorene (plus other products which are primarily book binding cleaners). Papers used: new wood pulp and rag pulp papers, old rag papers, vellum (also leather).

McInnis, K. "Study 2: Dry Cleaning of Paper," IICM Bulletin, June 6, 1980) pp. 43-52.

Evaluated abrasiveness of dry cleaning products and amount of residual eraser on sized (with methyl cellulose) and unsized, aged and unaged, paper samples. Erasers tested included: Art Gum ('AKA' Art Eraser 430), Mars Plastic, Artists Rubber kneaded eraser, Draftsman's ABC Cleaning Pad.

Moffatt, E. and M. Laver, "Erasers and Related Dry Cleaning Materials," (Unpublished) CCI Analytical Report, ARS No. 1738, File No. 7034-20-3, Oct. 20, 1981.

Report includes analytical information cited in CCI ARS 1738. (See above.) Assessed eraser residue left on paper samples. Provides information on various chemical and physical concerns for eraser use. Erasers included in report: Magic Rub Pencil, RW 30, Rubkleen, Pink Pearl 101, Star Gum Cleaner, Magic Rub, Koh-i-lar 286, Mars Plastic, TK-7081, Magic Rub Electric eraser refill, Skum-X powder, Dandy Rub Stick, Wallpaper Cleaner, Silly Putty. Papers used for testing: Arches 88 silkscreen, Greens' Cotman (Royal Watercolor Society) 100% Rag, Kozo white, black Japanese paper.

Mowery, Frank, "Products and Services," Chemical Sponges, Abbey Newsletter, Vol. 15, No. 7, November 1991, p. 120.

Pearlstein, E. J., D. Cabelli, A. King, and N. Indictor, "Effects of Eraser Treatment on Paper," Journal ofthe American Institute of Conservation, Vol. 22, No. 1, Fall 1982, pp. 1-12.

Studied composition and aging behavior of dry cleaning products, and examined effects on paper after treatment with these products. Notes changes in fold endurance, tensile strength, surface pH, color, texture, and wettability of aged and unaged paper samples. Erasers tested: Opaline Pad, Art Gum 100, Pink Pearl 101, Kneaded Rubber, Magic Rub 1954. Paper Used: Whatman Chromatography paper.

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3/27/92
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