Carpet Maintenance
For the
Commercial Market

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How does commercial carpet maintenance differ from residential carpet cleaning?

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<th>Commercial</th>
<th>Residential</th>
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<tr>
<td>Market Share</td>
<td>32%</td>
<td>68%</td>
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<td>Fibers</td>
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<td>Daytime</td>
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<tr>
<td>Amount cleaned</td>
<td>1,000 – 100,000</td>
<td>300 – 2,000</td>
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<td>Cash flow</td>
<td>30 – 90</td>
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<td>January – December</td>
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<tr>
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Commercial Markets

In our industry when commercial cleaning is mentioned the thought of apartment complexes and greasy restaurants at midnight comes to mind. While these two categories can be cleaned profitably they are very difficult markets. Newer cleaning companies tend to target these two categories because of their abundance and because they always seem to be in need of cleaning. Because of the number of cleaners bidding on apartments and restaurants the price tends to be depressed. This market tends to be poor in the loyalty category. Price fuels this market.

Remember this saying “what you sell it on, is what you will lose it on.” What that means is if the customer chooses you on price, when they find a better price (and there is always a better price) they will drop you. If you sell on high quality and dependability you will keep the customer long term unless your quality or dependability slips.

Looking at the comparison between residential and commercial cleaning, you may wonder why you should pursue the commercial market. Thoughts of greasy restaurants, slow pay, late nights and fighting with janitorial staffs aren’t very attractive. Besides with 75% of the market why shouldn’t you focus your efforts on the residential market? Good question.

Whether you are just starting your business or you are a 20-year industry veteran you will someday want to sell your business. Businesses do not generate big sale prices when the package includes old equipment, trucks and a file cabinet of invoices. The new business owner is looking for a guaranteed cash flow and that is where commercial business can play a huge role. Signed maintenance contracts are money in the bank. Developing a maintenance program will be covered later. Two big questions need to be answered to effectively sell maintenance programs.

Why should a building owner or facility manager want a maintenance contract?

Hard surface maintenance is much cheaper, why should you want carpet?

1. Life cycle costing of the carpet can be drastically improved with a maintenance program.
2. Maintenance of hard surface in a school with light to medium traffic can be 31% more costly than carpet over a 22 year period versus carpet. In a heavy traffic situation this figure jumps up to 53%. In a 50,000 square foot school this results in a $55,000 savings per year in cleaning expense. *Source: Carpet & Rug Institute.* http://www.carpet-rug.org/studies.cfm


4. Carpet has many aesthetic benefits besides appearance.
   a. Sound absorption
   b. Insulation
   c. Comfort
   d. Reduced slip and fall hazard
   e. Less fatigue

Markets for commercial cleaning:

**Schools**
- **Advantages**
  - School not equipped with adequate maintenance equipment
  - Janitorial staffs not qualified
  - Studies prove benefits of maintained carpet
- **Disadvantages**
  - Budgetary restrictions
  - Limited time to clean – Summer & Holiday breaks

**Offices**
- **Advantages**
  - Need to amortize expense of carpet
  - Appearance important
  - IAQ issues are important
- **Disadvantages**
  - Downturn in economy effects maintenance budget
  - Large buildings may have own staff

**Health Care**
- **Advantages**
  - Cleanliness is critical to patient care
  - Difficulty in replacing carpet means maintenance is needed
- **Disadvantages**
  - May be 24 hour facility
Retail
- **Advantages**
  - Chain stores provide volume
  - Normally first floor, easy access for truck mount
- **Disadvantages**
  - Cheap prices due to consolidators
  - Rarely maintenance usually restoration

**Commercial Property Managers**
- **Advantages**
  - Need quality and flexibility in scheduling
  - Normally vacant jobs
- **Disadvantages**
  - Many high rise jobs require more time and different equipment

**Funeral Parlors**
- **Advantages**
  - Appearance is top of needs
  - Additional work is available (drapery and upholstery)
- **Disadvantages**
  - Job may be rescheduled at last minute

**Banks**
- **Advantages**
  - Appearance is important to banks clients
  - Prime customer for maintenance programs – easily sold on life-cycle costing
  - Security and dependability more important than price
- **Disadvantages**
  - Security may require portable usage

**Apartment Management**
- **Advantages**
  - Operationally efficient company with repair and dye skills may be able to dominate the market and overcome normal pricing difficulties
- **Disadvantages**
  - Less than operationally efficient company will lose money
Small manufacturing plants
- **Advantages**
  - Competitors usually ignore these places. Normally there is a carpeted office that is soiled by plant traffic.
- **Disadvantages**
  - None

Churches
- **Advantages**
  - Require high appearance levels
  - Can be cleaned during workdays
  - Usually more spots than traffic areas
- **Disadvantages**
  - Usually needs financial board approval

Hospitality
- **Advantages**
  - Hotels need to keep up appearances or business drops
  - Full scale hotels have many opportunities
    - Rooms
    - Restaurants
    - Lobbies
    - Meeting facilities
  - Hotel staff cannot handle large scale cleaning
- **Disadvantages**
  - Scheduling is difficult due to occupancy rates
  - Fast drying is critical
  - High rise hotels are challenging
  - Quantity of rooms can depress pricing

While there are many different commercial markets, specializing in one may differentiate your company from the competition. Commercial customers expect the carpet to look good continuously. Residential customers expect the carpet to look good after the cleaning but realize that they are responsible for the daily cleaning.

The volume of carpet and the idea of long-term maintenance forces the commercial maintenance company to base prices on true costs and not as a one time residential cleaning job. Due to the emphasis on cost control the technician should be focused on productivity and safety as both affect profitability. Hiring and training the right person can have a huge effect on the retention of commercial customers.
Qualities of a good maintenance technician

Too often we confuse the role of a carpet specialist with the person who empties the trash and cleans restrooms. While in a small company one person may perform both functions, normally the carpet specialist is from an outside source as opposed to an in-house staff. Commercial maintenance requires a different mindset than residential cleaning.

**Attitude** – Commercial maintenance should always be considered a long-term process. The maintenance is usually done during the evening or on weekends. If you are cheery in the morning but fade in the evenings this is not the job for you. If you need constant supervision this is not the job for you. Even though the building may be empty the use of radios and other devices such as Walkman CD Players are not acceptable.

Your attitude and suggestions towards the profitability of the company contributes to your continued employment. These areas can be profit drains:

1. **Punctuality** – be early. **Confirm your schedule and** have a backup plan in case of trouble. **Suggest ways to cut costs.**
2. **Communication** – let your supervisor know of any problems encountered before the client contacts your office. Call immediately if there is a problem e.g a tripped breaker. **Additional work** – let your supervisor know if the client needs additional work. Do not do any work that you lack training in.
3. **Completed paperwork** – simplifies billing and future scheduling.
4. **Failure to maintain equipment** – failure to maintain equipment can cost more than just a part if it fails on the job.

**Appearance** – *Every Picture Tells a Story* - Rod Stewart

1. **Grooming** – it doesn’t matter that you think purple hair is stylish, it is what the customer thinks that is important.
2. **Uniforms** – a uniform projects professionalism and the illusion of a large company regardless of your company’s size.
3. **Clean shoes** – if they are leather shine them. If they are tennis or running shoes, be sure they are a solid color and clean.
4. **ID badge** – a picture ID reassures the client that they are working with a trustworthy company.

**Language** – it is not just the words. Communicate in a positive and professional manner. Verbal language is composed of three components:

- Body language 55%
- Tone 38%
- Words 7%
Timeline History of the Carpet Industry in the US

1791 William Sprague starts first carpet mill in Philadelphia
1839 Erastus Bigelow invents power loom
1845 Alexander Smith builds carpet plant in NY
1849 Jacquard mechanism invented
1877 Bigelow creates first broadloom carpet.
1900 Catherine Whitener sells first chenille bedspread
1926 Karastan Rug Mills open
1930 First mechanized tufting machine created in Dalton
1947 Nylon introduced for carpet
1950 97 million yards, 10% tufted, 90% woven
2011 17.62 billion sq. ft. 90% tufted

Carpet retains 60% of the commercial flooring business.

Total fiber usage:

Nylon 55%
Polyester 28%
Olefin 17%
Wool 1%

Source: Carpet & Rug Institute, Dalton, Georgia & FCW
Carpet Fibers

How a carpet fiber performs in an environment depends on many things: the carpet construction, the yarn construction, the type of installation, the quality and frequency of maintenance, the type of cushion used (when applicable) and the type of fiber used. Each fiber has different characteristics that do not change. A characteristic that may affect cleaning is how the fiber repels or attracts various soils and stains.

Fibers are broken into two major categories:

**Natural** - derived from plants or animals.
- Protein – Wool, Silk – *less than 1% commercial*
- Cellulosic – Cotton, Jute – *only used as backing yarn in woven goods*

**Synthetic** – derived from petrochemicals or renewable sources.
- Nylon – *still the king with help from carpet tile*
- Olefin – *declining in market share*
- Polyester – *residential only*
- PTT – *slowly entering market*
- Acrylic – *may be blended with wool*

Natural and synthetic fibers differ in their ability to absorb moisture. Natural fibers have a high absorbency rate while synthetics have a low absorbency factor. This affects how the fibers are dyed and how easily they are stained. One additional concern is drying time. **Natural fibers normally take longer to dry.**
Wool is obtained from the fleece of sheep.

**Characteristics:**
- Oldest fiber used in carpet and
- Naturally resilient due to fiber crimp
- Good abrasion resistance
- Dyes easily
- Cleans well – clean between pH 4.5-8.5 ***
- Natural soil resistance, releases soil easily
- Natural protective membrane repels moisture
- Natural fire resistance

**Concerns:**
- pH above 8.5 can damage outer layer (epidermis)***
- Silicones can cause resoiling
- Chlorine bleach (sodium hypochlorite) dissolves wool
- Stains are very difficult to remove
- Bleeding and crocking are more of a concern
- Aggressive agitation can damage epidermis
- Expensive

Do not confuse wool Berber with olefin Berber
**Cellulosic – plant based**

**Cotton** - used only in rugs and as a backing yarn

**Characteristics:**
- Dyes easily
- Great hand (feels soft)

**Concerns:**
- Easily browns due to high cellulosic content
- Shrinkage
- Stains easily
- Poor resilience

**Jute** – same concerns as cotton

Jute is one of the cheapest natural fibers and is second only to cotton in amount produced and variety of uses. Jute fibers are composed primarily of the plant materials cellulose (major component of plant fiber) and lignin. *The only place jute is found in commercial woven goods as a backing yarn.*

**Synthetic fibers comprise over 95% of the fibers used in the manufacture of carpet.**

All synthetic fibers are manufactured the same way – fiber **extrusion.** Polymer chips are blended and heated to a liquid form, then forced or extruded through a piece of equipment known as a **spinneret.** Spinnerets contain hundreds of tiny holes, which determine the **cross section** of the fiber. The fibers are then cooled in a cooling tower and become solid **filaments.** Each hole in the spinneret produces a filament of fiber. The filaments are then drawn, crimped and stretched and bulked, resulting in **BCF – bulked continuous filament,** which is wound onto cones and shipped to a yarn facility. The fibers can be cut into 6-8 inch lengths after the drawing process and baled for shipment to a spinning mill. This is referred to as **staple** fiber and staple is produced from the bales.
Nylon – the most popular fiber used in carpet

Characteristics:
- Great resiliency (ability to spring back after compression)
- Accepts dyes better than other synthetics (mostly acid dyes)
- Cleans well
- Resists abrasion
- Dissolves in formic acid

Concerns:
- Attracted to acid dyes

Generations of nylon – first introduced in 1939 by Dupont
First: round fiber magnified soil
Second: modified shape to trilobal
Third: added property to reduce or dissipate static charge
Fourth: added fluorochemical to resist soil and stains
Fifth: added acid-dye blockers to repel acid dyes

Olefin (polypropylene) – popular in inexpensive direct glue installations.

Characteristics:
- Must be solution dyed
- Most stain resistant
- Excellent fade resistance
- Least water absorbent
- Floats on water due to specific gravity less than water
- Cleans well

Olefin glue down installations can be difficult to clean with HWE. Wicking problems can be minimized with low-moisture systems such as encapsulation. Dragging furniture can cause friction burns.

Concerns:
- Poor resilience
- Low melting point (watch those hot couplers)
- Attracted to oily soils causing yellowing

Polyester – should not be used in commercial applications.
Characteristics:

- Excellent stain and fade resistance
- Good color clarity
- Cleans well
- Dyed with disperse dyes, not attracted to acid dyes

Concerns:

- Poor resiliency
- Attracted to oily soils
- Poor choice for commercial carpet.

The most common polyester for fiber purposes is polyethylene terephthalate, or simply PET. This is also the polymer used for many soft drink bottles and it is becoming increasingly common to recycle them after use by remelting the PET and extruding it as fiber.

**Triexta: Poly Trimethylene Terephthalate**

Characteristics:

- Resilience and cleanability of nylon
- Abrasion resilience equal to nylon
- No static problems
- Equal to polyester in repelling acid dye stains
- SmartStrand exclusive to Mohawk for residential carpet

**Acrylic** – originally marketed as the synthetic wool because of its similar characteristics. Frequently blended with wool for cost savings.

Characteristics:

- Always a staple fiber
- Usually solution dyed or stock dyed

Concerns:

- Poor abrasion resistance
- Poor soil hiding
- Poor resilience
- Fair cleaning
- Shading
**FIBER ID by Burn Testing**

<table>
<thead>
<tr>
<th>Fiber</th>
<th>Flame</th>
<th>Odor</th>
<th>Ash/Residue</th>
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</thead>
<tbody>
<tr>
<td>cotton/jute</td>
<td>orange ember</td>
<td>burning paper</td>
<td>ash</td>
</tr>
<tr>
<td>rayon</td>
<td>orange</td>
<td>burning paper</td>
<td>no ash or bead</td>
</tr>
<tr>
<td>wool</td>
<td>orange/sputters</td>
<td>burning hair</td>
<td>black ash/crumbles</td>
</tr>
<tr>
<td>silk</td>
<td>orange</td>
<td>burning hair</td>
<td>black beads/crushes</td>
</tr>
<tr>
<td>nylon</td>
<td>blue base/orange tip</td>
<td>plastic/celery</td>
<td>round, black bead</td>
</tr>
<tr>
<td>olefin/polypropylene</td>
<td>blue base/orange tip</td>
<td>asphalt</td>
<td>round, gray to brown bead</td>
</tr>
<tr>
<td>polyester</td>
<td>orange sputters black</td>
<td>sweet/fruity</td>
<td>round, shiny, black bead</td>
</tr>
<tr>
<td>acrylic</td>
<td>white/orange/sputters</td>
<td>acrid,burnt meat</td>
<td>black crust can be crushed</td>
</tr>
</tbody>
</table>

Use butane lighter to avoid sulfur smell of matches. Use a cup or ashtray.

Chemical tests:
- Nylon – formic acid
- Wool – sodium Hypochlorite
- Olefin – floats on water
Review #1
Fibers

1. Natural fibers are very _____________ which means they absorb dye easily, stain easily, and take longer to ________.

2. The most popular synthetic fiber is ________________.

3. Olefin loves ______ and hates ________.

4. Wool and silk are examples of ______________ fibers.

5. Nylon can be dissolved by ________ acid.

6. Wool will not ______ and smells like a wet ____ when wet.

7. The _____________ of a wool fiber can be damaged by ________.

8. ________ can dissolve a wool or silk fiber.

9. Polyester is not a good choice for a ___________ building.

10. Olefin is always ________ dyed but ________ easily.

11. All synthetic fibers are __________ through a ________________.

12. The ______________ fiber is a synthetic substitute for wool.

13. Nylon is attracted to ______ dye stains and should be cleaned with a pH under ______.

14. When a synthetic fiber is burned it leaves a hard _____ when a natural fiber is burned it leaves an ____.

15. The two most popular fibers for commercial carpet are __________ and __________.
Yarn manufacturing

BCF yarn requires only two processes – twisting and heat setting.

Staple yarns are popular because they resemble wool, a natural fiber. Staple or spun yarns need additional processing:

- Blending insures that the product is as uniform as possible. This helps to prevent dye streaking.
- Carding straightens the various fibers and creates a yarn sliver.
- Pin drafting continues to blend the fiber and get the fibers as parallel as possible before twisting.
- Spinning is the actual formation of the yarn.
- Plying is the process where 2 or more yarns (2 ply) are twisted together to form the final plied yarn for tufting. The twisted yarn must be heat-set to maintain the twist and provide a yarn memory.
Staple fiber due to its short length sheds throughout the life of the carpet but especially when it is new. You or the end user may notice bunches of fiber in your vacuum bag. This is not a defect. This is called shedding.

Dyeing – color is the visual effect that is caused by the spectral composition of light emitted, transmitted or reflected by the object.

**Primary** colors – *red, blue, yellow*

**Secondary** colors are blends of primaries.

Methods of dyeing

**Predyed:**

- **Solution** – adding pigment to the polymer before extrusion. Olefin **must** be solution dyed while all extruded fibers **can** be solution dyed. All extruded fibers may be solution dyed.
- **Stock** – dyeing of fibers in staple form.
- **Yarn** – dyed in yarn form before the fabric stage.

**Post Dyed:**

- **Continuous** – a process in which the fabric or greige goods pass through dyeing and subsequent operations without interruption.
- **Beck or batch** – a process in which separate pieces of fabric are handled sequentially through dyeing and subsequent processes. These 2 processes are referred to as piece dyeing and are the most popular for residential goods.
- **Print** – application of the dye in a pattern applied through a screen or rollers. Used frequently in hospitality and restaurants.
Dye terminology:

- **Pigment** – an insoluble material used to dye fabrics especially solution dyes.
- **Dyes** – substances that add color to textiles.
- **Dye sites** – area within the fiber that provides sites for chemical bonding with the dye molecule.

Color Loss Concerns:

- **Bleeding** – loss of color by the fabric or yarn when contacted by water, as a result of improper dyeing or the use of poor quality dyes. High alkaline cleaners can increase the chance of bleeding. High temperatures will accelerate the reaction. When bleeding is a concern leave the carpet in an acid pH state.
- **Crocking** – the rubbing off of a dye from a fabric as a result of insufficient dye penetration or fixation. Crocking can occur under wet or dry conditions but requires agitation. A person sitting on a white chair with new blue jeans may leave a blue tint on the chair.
- **Fume fading** – a shade change of a fabric caused by a chemical reaction between dyes and acid gases from fuel combustion, particularly oxides of nitrogen.
- **Bleaching** – products such as household bleach (sodium hypochlorite), benzoyl peroxide, fertilizers.
- **Pesticides** – loss of color around room perimeters.
- **Ozone fading** – loss of color usually blue, NO2 causes red loss.
- **Lighter color** – if the color of the stain is lighter than the carpet, it is a loss of color and will need to be redyed or resectioned.

Various Color Problems:

- **Metamerism** – variation of color under differing light sources. e.g. sunlight versus fluorescent or incandescent. May look like spots.
- **Pile Reversal** – can be caused by traffic, shading, watermarking, pooling or the installer turned the carpet 180° at the seam.
- **Shading** – an apparent change in color when the pile is bent and the light reflects differently off the bent fibers.
• **Watermarking** – an irreversible, localized change in the orientation of the carpet. Considered a characteristic not a defect.
• **Wear** – a loss of 10% face pile in the traffic areas as opposed to the non trafficked areas.
• **Side match** – dye lots were not installed sequentially.
• **Soil shading** – abrasion of plastic like fibers causing a difference in the way the light reflects.
• **pH indicator dye stains** – imbalance of pH has caused a color change. Adjusting the pH can restore the color.
• **Dye lot variance** – each dye lot may have a slight color difference which may be noticeable at seams.
• **Sun exposure** – the UV in sunlight may cause a loss of color.

**Backing** – once the yarns have been spun it is time to turn them into a carpet or rug. The yarns in a tufting machine are inserted into a **primary** backing. At this stage the fabric is referred to as **greige** goods or an unfinished (undyed) material. The greige goods are dyed and receive an application of latex before being married to a **secondary** backing. The carpet is dried and sheared if needed and it is ready to be shipped.
• **Primary** made from polypropylene or jute.
• **Secondary** made from polypropylene or jute.
  □ Applying the secondary strengthens the carpet and provides **dimensional stability** (ability of a carpet to maintain its shape).
  □ **Synthetic backed carpets cannot shrink.** Only woven carpets with cellulosic yarns or jute backed tufted carpets can shrink.
• **Structured backing** may be used on carpet modules or six-foot carpet. This is usually a hard backing such as vinyl.
• **Unitary** is a single backing with a rubber or resin laminated to the bottom side. This backing does not have a secondary.
• **Woven** carpet has interwoven yarns (warp & weft) interlocked with a face yarn. This is all held together with a light latex coating.
• **Urethane** has an organic compound that is applied in the finishing process providing an additional cushion.
Review #2
Yarns & Dyeing

1. Synthetic fibers are created through a process called ____________.

2. Synthetic fibers can be either __________ or cut into __________.

3. Loose ________ fiber is normal in a cut pile and called __________.

4. Olefin can be damaged by __________ couplers and __________.

5. Olefin is attracted to __________ soils, this is referred to as being ____________.

6. Bulked continuous filaments are referred to as __________.

7. When 2 or more yarns are twisted together they have been __________.

8. A carpet that is dyed in a pattern is called a __________ carpet.

9. A carpet that has not been dyed is called __________ goods.

10. Olefin fibers must be __________ dyed.

11. Wool cannot be __________ dyed.

12. A pigment is ____________, a dye is ____________.

13. Optical brighteners can cause permanent __________ and void carpet ____________.

14. Pooling, watermarking, and __________ are __________ and are not considered __________ by the carpet manufacturers.

15. Bleeding requires __________ crocking requires ____________.
Carpet Manufacturing

**Weaving** – method of interlacing two yarns of similar material so they cross each other at right angles to produce woven fabric. Weaving is done on a loom and is much slower than tufting, which makes it more expensive. Woven carpet is distinguished by intricate patterns and is frequently comprised of wool. Two sets of yarn are used; the **warp** or lengthwise and the **weft** or filling yarn which is the crosswise yarn.

**4 components of a woven carpet**

- Pile
- Warp
- Weft
- Backcoat

**Tufting** – is the most popular form of manufacturing. Tufting machines resemble a multi needle sewing machine that insert the pile yarns through a primary backing and holds it in place as the needle is withdrawn.

**Needle punching** – the process of converting webs of loose fibers into a nonwoven fabric.
Fusion bonding – a thermoplastic process in which yarns are implanted in a liquid vinyl compound in a sandwich configuration between two backing materials. A knife splits the sandwich to create two cut pile carpets.

**Carpet Styles:**

- **Level loop** – loops of the same pile height

- **Multi level loop** – various pile height

- **Berber** – fat loop with colored flecks originally wool but now mostly olefin. **Residential only.**

- **Velvet/plush** – pile yarns are only slightly twisted and very dense and evenly sheared. **Residential only.**

- **Frieze** – a very durable cut pile heat set carpet with a kinked or curled yarn effect. **Residential only.**

- **Saxony** – cut pile carpet, highly twisted, evenly sheared medium length pile height. **Most popular residential style.**

- **Shag** – loosely tufted carpet with long yarns with wide spacing. Shag has overcome the bad press of the late 60’s when it was made primarily of single polyester yarns. The yarns tended to crush together creating a very ugly carpet. Today’s shags are made primarily of a more resilient nylon. Most styles have a thick cable yarn and a single accent yarn. Modern shags are stylish but very difficult to vacuum and clean. **Residential only.**
Carpet Tile/Modules is the fastest growing segment of the carpet industry. It is the most durable of any carpet product. Easy to install and easy to replace a damaged tile makes it popular. The one caution is that the tiles tend to wick back spots easily. For this reason interim maintenance methods such as encapsulation work well.

Carpet Finishing
Once the carpet has been dyed it is ready to go through the coating process. Latex is applied to the primary backing as well as the secondary backing. The carpet is attached to the secondary via a marriage roller. The carpet then goes through a dryer so the latex can cure.

The shearing process involves the removal of loose or projecting fibers and surface lint from the face of the carpet.

The final step in the finishing process is the inspection. Before the carpet is wrapped and sent to the distribution facility it is checked for any visible manufacturing defects.
Carpet cushion/pad

Proper cushion provides several benefits:

- Extends the life of the carpet by preventing matting and crushing.
- Improves the acoustical properties.
- Provides better thermal insulation.
- Vacuuming is easier.
- Safety is enhanced.
- Carpet feels more luxurious.

While the benefits listed above are valid, cushion is not installed as frequently in commercial properties. Due to greater traffic counts many carpets are glued directly to the floor which is referred to as direct glue-down.

Carpet cushion should be selected according to the carpet manufacturer’s requirements for thickness and density. Cushion for commercial installations should not exceed 3/8 inch. Cushion should be specified according to traffic requirements. There is nothing worse than installing the wrong cushion in a commercial building. Crushing, matting, wrinkling, buckling and separation of the carpet backing or seams can develop causing permanent damage to a carpet.

Certain styles of carpet may also have an attached cushion which is installed as a direct-glue down. This style combines the ease of installation with the benefit of a durable cushion.

Other styles may include carpet modules that includes an adhesive or “tackifier” that is applied to the backing and is covered by a removable plastic. During installation the plastic is removed and pressed to the floor. With this type of installation the carpet can be easily peeled up without any damage to the carpet or subfloor. These systems also eliminate odors.

**For best carpet performance a chair protective pad should be used under rolling chairs.**
Installation – Having a good knowledge of proper installation techniques prevents paying unjustified claims.

Commercial Carpet

*Standard for Installation Specification of Commercial Carpet, CRI 104* is the definitive industry minimum commercial installation standard.

Residential Carpet

*Standard for Installation of Residential Carpet, CRI 105* is a definitive industry minimum residential installation standard.

These standards are available free of charge and may be downloaded at www.carpet-rug.org

**Installation methods**

- **Stretch in** – Provides enhanced underfoot comfort, acoustical properties (i.e., higher noise reduction coefficients and higher impact noise ratings) when installed with separate cushion.

- **Direct-Glue** – carpet is glued directly to the floor.
- **Double Glue-down Installation** - Combines the stability of direct glue carpet with the cushioning benefits of a separate cushion, stretch-in installation. Improper floor prep or poor adhesive can cause failure.

**Installation Tools**

**Power Stretcher**– required for all stretch in over pad.

**Knee Kicker**– a positioning tool

**Seam sealer** – required on all cut seams

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Installation concerns

- **Carpet rippling** – caused by failure to power stretch the carpet. Alert the consumer that the carpet should settle to precleaning levels once the humidity has stabilized. **This may be delamination.**
- **Commercial Carpet bubbles** – improper use of solvents, improper adhesive or inadequate amount of adhesive can cause bubbles.
- **Seam separation** – may be lack of seam sealer.
- **Sprouting tufts** – should be trimmed with napping shears.
- **Pulled rows** – can be repaired. *Attend IICRC Repair class.*
- **Dye loss** – recolor or resection.
- **Delamination** – separation of primary backing and face fiber from secondary backing. Some causes of delamination are:
  - Improper specification
  - Improper latex formulation
  - Improper use of solvents
  - Wrong cushion

Strategies for Improving the Indoor Air Quality

1. Keep walkway and entries clean to eliminate tracking and debris.
2. Use mats to trap soil at entries to protect carpets and reduce the quantity of particles that eventually becoming airborne.
3. Clean shoes at entries to reduce fine particles such as lead.
4. Use quality vacuum equipment. Check the Carpet and Rug Institute’s list of vacuums that passed the Green Label Program at: www.carpet-rug.org.
5. Use high-efficiency vacuum filter bags. Small particles can pass through inexpensive paper filter bags.
6. Vacuum frequently before soils become embedded in the carpet.
7. Use quality reusable electrostatic filters for HVAC systems. Remove and flush them free of collected soils monthly.
8. Have the carpet cleaned professionally. To find a certified technician, check with the IICRC at (800) 835-4624 or www.iicrc.org.
10. Control moisture and humidity to keep down dust mites and mold.

Source: Institute of Inspection Cleaning and Restoration Certification
Common factors that Affect Indoor Air Quality

People (exhalation, body odors, and diseases)
Activities (work such as cleaning, using correction fluids, carbonless paper, pest control products, and personal activities such as wear fragrances and smoking)
Technology (photocopiers and laser printers)
Furnishings (furniture, draperies, floor coverings)
Finishes (paint, varnish, vinyl wall coverings)
Building materials (caulking compounds, adhesives, wood laminates)
Outdoor air quality
Inadequate or contaminated air handling units
Inadequate cleaning practices Source: Carpet & Rug Institute
Don’t forget to offer your customers a green cleaning alternative. According to a recent Harris Research survey nearly 60% of consumers would be extremely likely, very likely, or likely to purchase cleaning products that are specifically designed to be environmentally friendly.
Review #3 Manufacturing & Styles

1. Woven carpet is made on a ________ and the yarns consist of a
   ________yarn a __________ yarn and a __________ yarn.

2. A tufted carpet consists of a face ________stitched in to a__________
   backing with latex bonding it to a ________ backing.

3. Most tufted carpet has a __________ backing but some woven carpet has
   cotton or _______ yarns which can __________.

4. The number of tufting needles across the width of the tufting machine is
   referred to as the ____________.

5. Glue down level loop carpet can be difficult to clean because of the
   cleaning wand _________ and excess moisture and soil __________.

6. An inexpensive cushion will cause the carpet to ________.

7. A few styles of commercial carpet have an __________ cushion.

8. All stretched in carpet must be installed using a _____ stretcher.

9. The CRI Standard for installation of commercial carpet is called CRI____.

10. Tufted carpet must have enough___________ to hold the yarns in and can
    be damaged by excessive use of ____________.

11. The separation of primary and secondary backing is called__________.

12. Seam sealer prevents the seams from ________________.

13. A stretch in carpet that ripples normally settles when ________.

14. Be careful with solvents on a _______ _________ carpet.

15. Download CRI installation standards from www.__________.
1 micrometer is a unit of measurement = 1/1,000,000 of a meter

Definition of Cleaning – IICRC S100-02
Cleaning is the traditional activity of removing contaminants, pollutants and undesired substances from an environment or surface to reduce damage or harm to human health or valuable materials. Cleaning is the process of locating, identifying, containing, removing and properly disposing of unwanted substances from an environment or material.

Soil is any unwanted matter on the surface of any object that one desires to be clean. Cleanliness is an unnatural condition, because all surfaces are constantly being soiled. In order to clean a surface, it is therefore necessary to work against nature and special care must be taken to ensure that all soil is removed and not redeposited on the surface.
Most soil is acidic in nature consisting of foods, soft drinks, bodily fluids, acid rain and other materials. The majority of soil is brought in from the outside by foot traffic. Materials such as sand and grit quickly work their way to the bottom of the pile where they can become trapped by compacted yarns. The majority of this tracked in soil accumulates at the entry points in the home. Fine particles (0.1 microns) have a significant effect on visible soiling. These particles, although by weight are minimal, actually are responsible for the soiled look of the carpet. Large particles fall to the bottom while fine particles may be trapped in the abrasions and imperfections of the fibers.

- Real soil – actual amount of soil in the carpet that can be weighed and measured.
- Visual soil – soil that changes the color and luster of the top third of the carpet.
- Apparent soil – soil that cannot be removed due to shading and abrasion. This is referred to as graying of the traffic lanes. This should be explained to the customer beforehand.

Shading, pooling, watermarking, pile distortion as well as wear and abrasion can make traffic lanes look darker even after proper cleaning.

<table>
<thead>
<tr>
<th>New Fiber</th>
<th>Soiled Fiber</th>
<th>Clean but abraded</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.png" alt="New Fiber" /></td>
<td><img src="image2.png" alt="Soiled Fiber" /></td>
<td><img src="image3.png" alt="Clean but abraded" /></td>
</tr>
</tbody>
</table>

Crushing

- Usually occurs in heavy-traffic areas and sometimes referred to as matting, magnified by sticky residue in the face yarn.
- In commercial office settings, carpet should be protected from rolling chairs with chair mats. Cubicle spaces should be considered as heavy-traffic areas.
- Be sure to remove and store the desk mats while carpet is drying. Do not lean them against the desk.
Classes of soils

Insoluble –

- sand, clay, quartz, 45%
- animal fibers, skin 12%
- cellulose, paper, grass 12%
- gypsum, apatite 5%
- limestone, dolomite 5%

Total Insoluble: 79%

Water Soluble -

- resins, gums, starches 10%

Total Water Soluble: 100%

Dry solvent soluble -

- fats, oils, rubber, tars 6%
- moisture 3%
- unknown 2%

Total Dry solvent soluble: 100%  

* Study performed by Hoover Vacuum Company 1953

Carpet filters soils, pollutants, gases, and animal dander. Like any filter it needs to be cleaned.

Nearly 80% of the soil is insoluble which means that it does not dissolve in water or solvents. The best and most thorough way to remove insoluble soil is through vacuuming.

General odor from soil:

- Odor in commercial buildings can be traced to soiled, warm, 68-86° dark, moist environments, with low air circulation where biopollutants are most likely to grow and multiply.
- Malodors generally indicate a contamination problem that generates complaints such as: Sick Building Syndrome. Including complaints of odor, and eye and throat irritation.
- Keep the building CLEAN & DRY.
- “New Carpet odor, 4PC, has no known toxic effect on humans.” It is primarily VOC emissions from the adhesives.
Principles of Cleaning

The objective of carpet cleaning is soil removal. Cleaning can be accomplished by several methods, but regardless of the method chosen, five principles must be followed to achieve the best results.

Dry soil removal – use of a CRI Green Label vacuum with a high efficiency filter is recommended.

HEPA (High Efficiency Particulate Air) is a filtering efficiency specification for filters developed by the Atomic Energy Commission during World War II to effectively remove radioactive dust from plant exhausts without redistribution. A HEPA filter must retain all particles as small as 0.3 µm in size with an efficiency rating of 99.97%. The phrases "as small as" or "at" mean that if all particles were that small, it would still have that efficiency. This should not be confused with the phrase "down to" which may mean a mixture of particle sizes for the stated efficiency. Particles smaller than 7 µm are not contained in low-efficiency bags and may become airborne.

Phases of vacuuming:

Prior to vacuuming if the carpet is matted or tangled in entries, pivot or high-traffic areas a brush or groomer should be used to separate the yarns. This will improve the airflow and allow the vacuum to remove more soil.

- Overall – Plug into centrally located outlet and work away, moving into open areas of carpet.
- Entries – Vacuum with at least 6 SLOW passes (15-25 feet into the building). The push pass is the positioning pass and the pull is the soil removal pass. Slow down on the pull pass.
- Edges – canister or back-pack vacuum to remove accumulation
- Removing soil when it is dry is a lot easier than removing mud.
- Empty the bag when it is 1/2 -2/3 full.

A truck mounted cleaning unit is not designed to remove dry soil regardless of the power of the vacuum system. Most manufacturers do not recommend...
the use of their systems for dry soil removal due to possible damage to the blower. The most effective tool will always be the vacuum cleaner.

**The importance of vacuuming with a high-filtration bag**

**Respirable particles**

<table>
<thead>
<tr>
<th>Particle Settling Rates 8 ft. ceiling</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1µm</td>
</tr>
<tr>
<td>1µm</td>
</tr>
<tr>
<td>5µm</td>
</tr>
<tr>
<td>10µm</td>
</tr>
<tr>
<td>15µm</td>
</tr>
<tr>
<td>30µm</td>
</tr>
<tr>
<td>50µm</td>
</tr>
<tr>
<td>100µm</td>
</tr>
</tbody>
</table>

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[Image of Respirable particles]

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[Image of Carpet Usage & Allergic Reactions in Sweden]

Source: Swedish Statistical Central Bureau

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Soil Suspension

Soils that were not removed during the dry soil removal step are suspended from the fiber during this step. This is accomplished through four fundamentals known as the cleaning pie.

**Time** – soil that has accumulated over months or years cannot be suspended in a manner of seconds. The preconditioner must dwell for a period of time to be most effective. The longer the better, but it should not be allowed to dry. On non-colorfast carpet the dwell time should be limited.

**Agitation** – provides uniform distribution of the preconditioner or detergent. This may be accomplished manually with hand brushing or with mechanical agitation, as long as adequate detergent lubrication is provided. The agitation helps to lift matted fibers.

**Chemical** – Detergents, builders and or selected solvents must be used to suspend, emulsify or saponify the various soils. Detergents used on stain-resistant carpet must be anionic or nonionic with a pH not to exceed 10. Detergents used on wool must be within a **pH near neutral and should be designed specifically for wool**.
**Temperature** – Increasing temperature reduces the surface tension of water, while it accelerates most chemical reactions, thereby causing cleaning agents to function more efficiently. Higher heat may reduce the quantity of cleaning agent required, which may result in fewer residues.

When one part of the pie is **decreased** one or more of the others must be **increased**.

![Pie chart diagram with T, A, C symbols indicating temperature, agitation, and chemical content](image)

In methods such as absorbent compound or encapsulation heat is missing from the fundamentals. In this case agitation has been increased by the brushing action.

**Soil Extraction**

Once soils have been suspended they must be physically removed from the carpet. Various cleaning methods accomplish extraction include absorption, wet vacuuming, rinsing or vacuuming of dry detergent residues and suspended soils.

Increased temperature during extraction improves cleaning agent efficiency. Temperature during extraction should be limited to 140 F at the carpet on cut pile wool, on noncolorfast carpet, and on velvet plush pile designs that might be subject to distortion when extreme heat 160 F plus is combined with high-pressure injection (over 300 psi).

Cleaning processes seek, as a minimum, to sanitize (clean to a generally healthful state) those environments, insofar as possible.

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Substances extracted from carpets by any method must be disposed of in accordance with all local, state and federal regulations.

**Grooming**
Grooming is recommended for appearance (removal of wand marks), for uniform distribution of carpet protectors and for proper drying.

**Drying**
The level of soiling, method of cleaning, humidity and airflow affect drying. The goal of every technician should be to have the carpet dry in 6-8 hours, but in a worst-case scenario in 24 hours.* The technician is responsible for any overwetting problems. *IICRC S100

Carpets that exceed proper drying time could result in slip and fall hazards, odors, and rapid resoiling. Technicians should post warning signs where slip and fall potential exists and alert customers.

Airflow is necessary to achieve drying. The technician should provide air movers combined with ventilation throughout the cleaning and drying process. Wicking is the upward flow of moisture on a surface and is improved by airflow.

Soils not removed during cleaning may wick to the yarn tips during drying and create dark areas or streaks.

**Is your equipment working as efficiently as you are?**
Check out these items regularly:

- ✔ Vacuum hoses and hose cuffs
- ✔ T-jets

* Copyright © April 2013 Bill Yeadon 38
Vacuum blower or fan vacuums
✓ Belts on blower
✓ Dump valve
✓ Lips of the wand
✓ Filter bag
✓ Are your pads or brushes in good shape

**Finally, are you making a sufficient amount of drying passes?**

The technician is responsible for the equipment as well as the technique. That means if there is an overwetting problem the technician is the culprit. The customer normally has one big question when they call for cleaning. How long will it take to dry?

The next chapter discusses the various methods. As a trained, conscientious technician you realize that each carpet is different due to fiber, construction, installation, and soiling patterns. Analyze the carpet and the needs of the occupants to select the ideal method for that carpet. But first let’s review soiling and principles of cleaning.
Review #4
Soiling & Principles

1. Soil is normally _______ on the pH scale.

2. The highest percentage of soil is ____________.

3. The best way to remove dry soil is by ______________.

4. Soil shading is caused by ________ of plastic fibers.

5. The principle of ____ _______ _________ is frequently skipped.

6. The cleaning pie consists of T______ A_________ C_________ T___________.

7. The second principle is _______ suspension.

8. Extraction can include ____________.

9. Water soluble soils cannot be removed by ____________.

10. Hair, sand and skin are considered ______________.

11. Empty a vacuum bag when it is ____ to _____ full.

12. A micron or micrometer is 1 ______________ of a meter.

13. Fast drying prevents _______ and _______ hazards.

14. A carpet should be groomed to remove _______ ______ and help the protector be ______________ evenly.

15. The ________________ is responsible for___ ___________. Some of this may be caused by lack of ____________ maintenance.
Methods of Cleaning

As previously discussed, each method needs to adhere to the five principles of cleaning to achieve maximum cleaning. All methods of cleaning use detergents. The difference is in the carrier used (water, foam, compound) to deliver the detergent. All methods can improve the effectiveness and contribute to the effective removal of biocontaminants by increasing the temperature of the chemical.

The first step in all methods is thorough dry soil removal using a vacuum with a high efficiency filtration system. Rotating brush action is the most aggressive method for agitating commercial carpet during vacuuming.

A pile lifter helps remove imbedded soils and groom the pile.
Absorbent/Adsorbent Compound

This method may incorporate the use of an organic or synthetic carrier that contains detergents, solvents and a bit of moisture. The compound may or may not be preceded by a preconditioner. The compound can be spread by hand or a specially designed machine. Brushing is used to spread and agitate the compound that absorbs/adsorbs the suspended soil and is then removed by dry vacuuming.
Dry Foam

Dense foam is produced by a dry foam machine through mechanical aeration of a liquid detergent. A preconditioner may or may not be used prior to application of the foam detergent. The foam is distributed and agitated via mechanical brush action. Suspended soil and the foam are extracted by the same machine or with a wet vacuum.

Figure 1 Dry Foam Machine

Figure 2 Rotating Brushes & Extraction
Absorbent Pad (Bonnet /Oscillating Pad)

A preconditioner may or may not be used prior to cleaning. Detergent in either a dry-solvent based or a carbonated or non-carbonated water-based carrier is sprayed onto the pad and the carpet. The pads may be round or square towels made of cotton, rayon, synthetics or a combination of fibers. In place of spraying the pad they may be dipped into a bucket of cleaning solution. During the agitation (spin buffing/oscillating) phase of soil suspension, the bonnet (pad) attracts or absorbs suspended soils. Technicians must monitor the rate of soil attraction to the pad and turn it over or replace it as soil accumulates. When both sides of the pad are soil saturated, it must be exchanged before continuing in order to assure maximum soil removal.

Different pads for different situations

Shower fed or spray with T-jet
**Shampoo**

A preconditioner may or may not be used prior to shampooing. A high-foaming detergent is applied to the carpet nap through a shower or channel-feed, nylon bristled brush rotating at a speed recommended by the equipment manufacturer that is safe for the carpet being cleaned. The agitation of the brush creates the foam that suspends the soil. Depending on the detergent used, either a wet vacuum extracts the suspended soils and detergents or upon drying the suspended soils and detergents are dry vacuumed. Brushes not properly lubricated with shampoo can cause textural damage to the carpet.

A brush or floor pad may be used depending on the carpet. Use caution on cut pile carpet. For extreme soiling a rotary brush followed by Hot Water Extraction is unbeatable.
Encapsulation

The cleaning agent is brushed into the carpet using a cylindrical or rotary brush machine. The encapsulation chemistry surrounds each soil particle and crystallizes it so it can’t attract other soil. The encapsulated particles release from the fiber and are removed through dry vacuuming. Encapsulation works well to prevent spills from wicking following cleaning.

Encapsulation is ideally suited for commercial maintenance especially in office, church, schools and other areas where high productivity, lower costs, and fast dry time is critical.

Crystallized soil
Hot Water Extraction (HWE)

A preconditioner is normally applied through a pump sprayer, in-line sprayer or by using a rotary shampoo machine. The suspended soil along with the preconditioner is flushed from the carpet with a HWE machine. Heavily soiled carpets may need several flushing passes and followed up with several overlapping extraction only passes.

Complete drying should be accomplished in 6-8 hours, but not to exceed 24 hours. Additional extraction passes; air movers and good ventilation will expedite drying. Over wetting or prolonged drying are normally due to operator error.

All extracted solutions must be disposed of according to local rules and regulations. Wastewater should be disposed of into a sewer line leading to a wastewater treatment station.

All methods should be followed by pile setting or grooming as necessary. Nap setting must be accomplished for uniform distribution of all post cleaning treatments.

Understanding the components of an extractor is important to the end result. HWE can be broken into two main categories:

- Portables

  box and wand

walk behind
• **Truck mounts**
  - van powered or direct drive
  - slide in units (separate engine)
  - electric

The major difference between the portables and truckmounts is productivity. A few portables have direct water and waste hookups most truckmounts can clean higher volumes of carpet due to greater heat, pressure and vacuum.

Vacuum is measured in two ways:
- Lift measured by inches of mercury (Hg) or water (H2O) lift.
- Airflow CFM – cubic feet per minute.

**Water pressure is measure in pounds per square inch “p.s.i.”**

HWE cleaning strokes:
- **Single pass** – apply solution on forward stroke and vacuum on backstroke.
- **Double pass** – apply solution on forward and backstroke shutting off solution momentarily at end of stroke. Be sure to give additional vacuum.
- **Chop stroke** – apply solution in short continuous strokes. Be sure to provide adequate vacuum passes when through. Use in heavily soiled areas. Use caution on velvet styles and wool carpet.

Wastewater should be disposed in a manner consistent with local, state, and federal laws. This usually means a sanitary sewer system.
Tools for HWE:

The choice of tools has expanded over the last decade. Tools come in all shapes and sizes from the original cleaning wand to several types of power heads. A technician would be wise to try different tools to see which is preferable before purchasing the tool.

Don’t forget to change those tee jets regularly.
Safety Issues: *It is the job of every tech to promote safety.*

Truck mounts that are powered by the truck engine should always be parked so that the exhaust faces away from the home. Fumes are easily drawn into the structure.

1. Truck mounts that use propane heaters should have the propane tanks mounted on the outside of the van. Be sure the valves have been shut off before driving.

2. Replace any solution hoses that are worn to prevent a line rupture.

3. Replace any electrical plugs that are missing the ground plug.

4. Make sure all equipment including wands has been secured in the van before driving. Be sure the back doors are closed before driving.

5. Have a Material Safety Data Sheet (MSDS) for every product on the truck including any household type chemicals. These sheets need to be in a folder accessible by the driver with his seatbelt fastened.

6. Every spray bottle and container must be labeled.

7. Carry and use goggles, gloves and respirators as necessary.

8. Use the proper gauge electrical cords with grounded wall outlets..

10. Drive safely and cautiously.

11. When mixing chemicals wear PPE and mix them in your facility or in your van. Use a measuring cup.

12. Purchase chemicals from a reputable source and mix chemicals by label directions.

13. Never leave samples of chemicals in unlabeled bottles.
OSHA Laws Applicable to Cleaning

- Hazard Communication (HAZCOM) Law
  - CFR 1910.1200 “Right to Know”
    - Mandatory Sign – “Job Safety & Health” protection MUST be posted
    - First aid kit available in workplace & van
    - 1910.134 Respiratory Protection
    - 1910.1030 Blood borne Pathogens
    - 1910.132 Personal Protective Equipment
Review #5

Methods

1. Regardless of the method chosen the ____________ must be followed.

2. The oldest method is _______________ ____________.

3. A very popular method for commercial maintenance is ______________ ________.

4. _______ _______ ________ has the most chances of overwetting.

5. Systems using a granular detergent are called_________ ________.

6. A system using a foaming surfactant using a cylindrical brush is called __________ ________.

7. The method favored by many carpet manufacturers is __ __ __.

8. When using an absorbent pad the pad should be changed when it stops __________ soil.

9. Systems using rotary action may cause ______ distortion.

10. Propane tanks should be mounted on the ______ of the van.

11. All trucks must carry __________, and a fire extinguisher.

12. Replace any plugs that are cut or missing the ________.

13. Replace any solution hoses that are ________.

14. Park your van so that ________ faces away from the building.

15. Wicking is minimized in a commercial building with multiple spills when using an __________________ system.
Chemistry

Many of us recoil in horror when we hear the word chemistry. It reminds us of that horrible class we took in high school. We were expected to memorize terms such as electrons, protons, valence and that terrible periodic table.

The difference between your high school chemistry class and learning cleaning chemistry is tremendous. Back then chemistry was a subject you felt you would never use. Today understanding a bit of detergent chemistry can not only make our jobs easier but also increase our profitability. But just like in school we need to learn some of the terms to really understand cleaning chemistry.

**pH** - the relative acidity or alkalinity of a water-based solution. The pH chart ranges from 0-14. Acids are below 7, neutral is 7, and everything above 7 is alkaline. Each number as it moves from 7 in either direction increases by 10 times the previous number.

In addition to pH the strength of a cleaning solution is determined by the concentration. This measures the amount of material in the solution. For example 7% acetic acid means of the total weight 7% is acetic acid.
Compound – a substance that contains two or more elements that have been bonded together by a chemical reaction. Soap is a compound.

Mixture - a substance containing two or more different elements mixed together, that can be separated easily but is not subject to a chemical reaction. Dirt in your vacuum cleaner bag is a mixture.

Solubility/solvent/– a solid that dissolves in a liquid is called a solute and is said to be soluble. The liquid that dissolves the solid is called a solvent and the resulting mixture is called a solution. For example, sodium chloride (salt) is soluble. It dissolves readily in water forming a colorless solution. Sand, on the other hand, is insoluble; it does not dissolve in water or solvent.

Suspension - most insoluble solids settle to the bottom of a liquid, but some split into tiny particles that spread throughout the liquid. This type of mixture is called a suspension. Milk is a suspension of fat particles in water.
**Emulsifier**— process of dispersing one liquid into another liquid with which it is **immiscible** (do not mix such as oil and water). Emulsifiers are important in cases where oily or fatty soils are encountered. The main ingredient in emulsification is the surfactant, with a little help from the builders.

**Surfactant**— (surface-active agent) chemical that when added to a liquid, changes the properties of that liquid at the surface. It allows penetration into the material being cleaned. It makes the water wetter. Surfactants are classified as **anionic** (negative), **nonionic** (no charge), **cationic** (positive). Anionics and nonionics are good cleaners. Biocides, antistats, bactericides and disinfectants normally have cationic surfactants.

**Builders**— are materials that enhance or maintain the cleaning efficiency of the surfactant by tying up the hard water minerals. It also supplies additional alkalinity for neutralization of acid soils, aids in keeping soil from redepositing on the carpet and emulsifies oily and greasy soils.

**Saponification** — The process of converting fat into soap by treating it with an alkali. It comes in handy in greasy restaurants.

**Hydrophilic** — water loving, **Hydrophobic** — water hating, these are opposite ends of the detergent molecule.

Water is used in most of our cleaning products. Water is attracted to other water molecules and surrounds itself with these molecules. At the surface these molecules are surrounded only on the water side. A tension is created as the water molecules are pulled into the body of the water. This creates a surface similar to the skin on a drum.
During cleaning, this surface tension must be reduced so water can penetrate the carpet. Chemicals that do this are called surfactants because they lower or break the surface tension and allow the cleaning solution to penetrate and begin cleaning.

Soaps have been around since ancient times. Soaps are made from fats and oils, or their fatty acids, by treating them with a strong alkali. The pioneers made soap by boiling animal fats with lye. Many rug-cleaning products were made with coconut oils because of their good foaming qualities. Unfortunately these shampoos also left a sticky residue behind which caused rapid resoiling. Soaps did not work well in hard water and formed a curd similar to the ring that develops in the bathtub.

Today we use synthetic detergents. Petrochemicals have replaced animal fats in detergents. These products do not break down in hard water like the soaps and do not leave a soil-attracting residue.

A properly formulated detergent has several ingredients:

**Surfactants**- helps to penetrate, lower the surface tension and wet out the fabric. Anionic (-) cationic (+) nonionic (o)

**Builders**- help to provide alkalinity and soften the water and prevent redeposition of the soil once it has been suspended. Soft water uses less detergent.

**Solvents** – designed to emulsify oils.

**Deodorizer**– because if it smells clean it is clean

Soap and detergent molecules do have one thing in common. One end of the molecule hates water (hydrophobic) and one end likes water (hydrophilic).

Think of a detergent molecule as resembling a tootsie roll pop. The head (the tasty part) is the water loving part and the tail or stick is the water hating part. If it is water hating that means it will go to anything that isn’t water such as oils in the soil. The stick/tail attaches to the oily soil while the head
is attracted to the water of the cleaning solution. Eventually the head pulls into the water and the tail pulls the dirt off the fiber into solution. This is normally happening during the preconditioning or soil suspension step. Agitation during this step speeds up the process and a hot solution will help to dissolve grease and oil on the carpet.

![Diagram of hydrophilic head and hydrophobic tail](image)

**Chemicals required for cleaning:**

1. **Preconditioners** – the workhorse of cleaning. Because most soil is acid most preconditioners and detergents are alkaline. Soil suspension is accomplished primarily with this step. These products can fall into several categories.
   - **General** - can be safely used on all synthetic fibers as long as the product has a pH under 10 and is not cationic.
   - **Heavy duty** – used on restaurants and greasy food facilities. Normally the pH is 10-12 and may include enzymes.
   - **Neutral to acidic** – mild products used on wool or any non-colorfast carpet.

2. **Rinse detergents** – added into cleaning solution. *Some carpet manufacturers may not approve of detergents in the tank.*
   - **Alkaline** – used on any synthetic including stain resistant carpet as long as the product has a pH under 10 and is not cationic.
     - Used when carpet is more than moderately soiled.
     - Can be used on wool if pH is 8.5 or below.
     - Can accelerate browning on cellulosic materials.
     - Most preconditioners are alkaline due to acidic soil.
   - **Acid** – used in place of an alkaline detergent when carpet is light to moderately soiled.
- Very effective in removing alkaline residue from previous cleanings.
- Stabilizes dyes while preventing browning.
- Breaks down alkaline salts from old urine.
- Usually dries faster than alkaline detergents.
- pH 2-5

Most carpet responds well to a quality preconditioner and rinse and will remove 90-95 of soil and spots.

Remember that most of all cleaning is being accomplished with two products, your preconditioner and detergent or rinse. This is not the time to look for the least expensive chemicals. Labor is the most expensive component of your business. If you use cheaper chemicals your labor expense will increase. Effective chemicals make the job easier and will result in happier customers. That means repeat business.

**Chemical dilutions**

1 gallon = 128 oz.
1 quart = 32 oz.
1 pint = 16 oz.
1 cup = 8 oz.
1:4 means 1 part chemical to 4 parts water. 128/4 = 32 oz. chemical to 1 gallon water.

Always dissolve powders in hot water and stir thoroughly.

Improper mixing can lead to rapid resoiling.
Review #6
Chemistry

1. The pH chart ranges from ___ to ___ with ___ being __________.

2. Any water based solution below 7 is ___ above 7 is ________.

3. A surfactant allows ______ into the fabric being cleaned.

4. A builder adds __________ and ________ water while __________ oily and greasy soils.

5. Hydrophilic loves ______ hydrophobic ______ water.

6. A surfactant resembles the candy _________ ____ ______.

7. Soaps do not work as well as detergents in _______ water.

8. The universal solvent which dissolves the most substances is ______.

9. The pH of toothpaste is on the ________ side of the pH scale.

10. The pH of a browning removal product is on the _______ side.

11. Rust is considered _______ so to remove use an _____ product.

12. Most disinfectants contain __________ surfactants.

13. Mixing a ______ surfactant with an ______ surfactant will make a gooey mess.

14. A dilution rate of 1:4 means you add 1 part_________ to __ parts water.

15. Most preconditioners are __________because most soil is__________.
Spotting for the professional

Once the carpet has been preconditioned and rinsed a few spots may remain. In many cases while 95% of the carpet may look great it may be these few spots that really provoked the customer to call. One coffee spot in a long hall ruins the appearance of the entire carpet. Spotting is critical. If you cannot remove these spots the customer may feel that you failed.

The difference between a cleaner and a professional is getting those spots out of the carpet. A word of caution, a few stains may not be removed. Learn how to resection a carpet and you can guarantee 100% spot removal.

Definitions:
- **Spot** – substance added
  - Gum, tar, food, ink
- **Stain** – color added
  - Wine, red pop, mustard
- **Discolorations** – color removed
  - Bleach, medicine,
- **Damage** – repair required
  - Toilet bowl cleaner, burns

Identification: before you can remove a spot you need to identify the category that it falls in. Knowing the fiber and backing type you are working on will help determine how aggressive you can get. In other words there is a big difference in taking red dyes out of wool versus olefin. Solvents are much riskier on glue down installations than on stretch in installations.

- Ask the customer
- Location – copy machine versus vending area
- Use your senses
  - Sight
  - Smell
  - Touch
  - Taste?
**Professional Spotting Kit**

Using a professional spotting kit will instill confidence in the customer that they chose the right company. The spotting kit should have a solid bottom and a lid that can close. Ideally it will have preformed slots so that a missing bottle is very evident before you leave the job site.

**Chemicals required:**

- **Solvents** – normally water free and used to break up oily or non-water-soluble spots (**nonpolar**). When using solvents wear PPE and provide plenty of ventilation. Solvents normally have a high flash point (**temperature at which a vapor will ignite**). Solvents should be used carefully to prevent delamination of the carpet backing.
  - **VDS** - Volatile Dry Solvent (**evaporates quickly**) solvents are only used for spotting, not total cleaning.
  - **NVDS/POG** - Nonvolatile Dry Solvent – also referred to as Paint Oil Grease remover – leaves a residue that needs to be rinsed. Provides more dwell time than a volatile solvent.
  - **Citrus gels** - same as POG except in a gel form which helps to prevent delamination of carpet or adhesive.

- **Water-based** – these spotters are used on water-soluble (**polar**) spots. Many of these spots are easily removed with a quality preconditioner and extraction.
  - **NDS** Neutral Detergent Spotter pH 6-8
  - **ADS** Alkaline Detergent Spotter pH 9-10
  - **AS** Acid/tannin spotter pH 4-6
  - **Enzyme/digester** pH 7 – designed to break down protein and carbohydrate materials that have become insoluble. Must be used with hot water 100-150° and at least 20-30 minute dwell time. Some spots may require even longer dwell time. The spot should be rinsed prior to application of the enzyme to provide a neutral environment. Rinse as the final step.
  - **Rust remover** pH 1-4 – neutralize and rinse after applying rust remover.
  - **Dye remover** – **caution** can also remove carpet dye.
Oxidizers/Reducers - color removal by adding oxygen

Oxidizers are bleaching agents. Before you think that you are going to damage all your carpet, you need to understand the different types of bleaches. The sun is a very large oxidizing agent. Ozone used in odor remediation is an oxidizer. A few are great tools and others will get us in trouble.

- Sodium hypochlorite/household bleach will dissolve wool and silk and destroy the color in nylon. While it can be safely used on 100% olefin it should only be considered in a salvage situation.
- Sodium perborate/percarbonate is a common ingredient in many boosters or energizers used in our industry.
- 3% Hydrogen peroxide is a very safe yet slow acting color remover. Effective on minor blood spots. It is always found in a dark bottle and should be kept in a cool dark place. Hydrogen peroxide is self-neutralizing. Higher % hydrogen peroxide used for hair bleaching may also bleach the carpet.
- Oxidizers can be accelerated by heat and light.
- A color made invisible by oxidizers is permanent.

Reducers/strippers perform a similar function (color removal) to oxidizers by removing oxygen from the stain.

- Reducers are not as permanent as oxidizers because the stain may absorb oxygen-containing moisture.
- Reducers are commonly found in coffee stain and browning formulas as well as in Haitian cotton cleaners.
- Accelerated by heat and acid. Careful!
- Sodium Bisulfite or metabisulfite are mild reducers.
- Sodium Hydrosulfite is much stronger with a terrible sulfur smell. Suppliers have new formulated products that are effective on mustard and furniture stains.
**Enzymes** – are protein molecules that accelerate chemical reactions by helping to break up other target molecules such as blood, eggs, milk and old urine into smaller soluble pieces. Most cleaning or spotting enzymes are proteolytic which means they break down protein.

Enzymes are not living organisms but biological catalysts and are highly specific. They work similar to a key and lock.

Microorganism deodorizers are made up of specific strains of bacteria or fungi, which are considered living, as compared to enzymes which are nonliving.

**Enzymes are easily deactivated by extremes of pH, temperature, cationic surfactants and require water at all times.**

**Spotting tools required:**

Always move equipment and chemicals not being used to a safe place.
pH paper  bone spatula

Tamping brush  napping shears

Trigger sprayer  Drip spout for spotting bottle

Inspection light  UV light

Gloves  Goggles  Respirator
Steps of removal – remember that you did not cause the spot or stain. Explain to the customer the options and the risks of each method. You do not determine which method to use. The customer selects after you have provided the information. If necessary have the customer sign a release. If the stain cannot be removed it is because of the characteristics of the staining material in relation to the fabric. It is not the weakness of the technician.

1. Always pretest your chemicals.
2. Wear appropriate PPE.
3. Follow the label directions.
   - Remove the excess – blot, scrape, absorb.
   - Check the solubility of the spot. When in doubt of the stains components use a volatile (evaporates quickly) solvent on a towel and blot. If it is solvent soluble it will transfer. If not it evaporates quickly and you can switch to a water-based spotter.
   - If the spot responds to your choice of spotter be sure to work on the spot from the outside in to avoid spreading the spot.
   - Patience! If you use the correct spotter most spots will dissolve given adequate dwell time.
   - Once the spot has been suspended rinse thoroughly.
   - If the carpet has a pile, groom the pile.
   - If you believe the spot may wick place absorbent paper toweling on the spot and weight to it. Inform the customer to remove the toweling in 12 –24 hours.
   - Sugary residues cause rapid resoiling and should be rinsed.

Concerns:

- Using more of a spotter can leave more residue and cause resoiling. More is not better. Additional dwell time, heat or agitation will work more efficiently.
- Never rub a spot. Use the tamping brush or a bone spatula. Wrapping a towel around the brush helps keep your brush clean and absorbs the spot.
- If the spot is lighter than the carpet you probably have color loss and the carpet needs to be redyed or resectioned.
- Urine spots and odor are difficult because the customer believes there is only 1 spot while there may be multiple locations. Once the residue has been removed there may be a color loss from old urine. The customer needs to be informed before spotting is attempted. More people are bringing their pets to work.
Specialty spotting – certain spots may require specialty spotters and techniques. Use caution and explain everything including risks to the customer prior to attempting spotting.

**Rust**

Hydrofluoric acid has been the most effective rust remover for years. Unfortunately it is the most dangerous. It desensitizes the nerve ending and can cause serious burning. When using any acidic rust remover such as hydrofluoric, oxalic, phosphoric or a specially formulated acid neutralize with an alkaline material and thoroughly rinse the spot. If the spot should turn a different color such as pink or purple use an alkaline spotter or ammonia and the spot should return to the normal color. This is referred to as an indicator dye stain and means the normal pH of the fabric has been affected. Hydrofluoric acid can etch glass. Watch where you set the bottle.

**Red dye**

Specialized spotters have been developed for red and other synthetic dye removal. Most use the heat transfer method. Apply the dye remover to the spot then place a damp towel and place the iron or wallpaper steamer over the spot. Check the towel after 15-30 seconds to see if there is a transfer. As long as the dye of the carpet is not transferring to the towel it is safe to continue.

*Pictures courtesy of Referral Cleaners*

**Mustard-**

Removing organic dyes such as mustard and furniture stain requires a reducing agent. Mustard and furniture stains are difficult to remove. For severe stains the chemical may need to be covered in plastic and allowed to dwell for 8-24 hours.
Coffee

Coffee contains a natural acid dye (tannin) plus it may be hot when spilled which easily penetrates wool and nylon carpet. Add a little cream and sugar and you have a mess. First choice is a Tannin/acid spotter. If that doesn’t work try a reducing agent such as sodium metabisulfite. Be sure to pretest for colorfastness in an inconspicuous spot.

**Persistent protein** (milk, gravy, egg)

Remove excess material and rinse. Work enzyme digester into spot. Cover with a hot wet towel. Place bucket of hot water on spot and wait 20-30 minutes. Remove observe and rinse. Important do not use hot water on protein spots.

**Blood**

Small amounts may be removed by a cool spotter or an enzyme/digester. For larger amounts follow blood-borne pathogen guidelines.

**Benzoyl Peroxide**

Is a bleaching agent (peroxide) present in acne medicine and other cosmetics or medications. It is activated by heat and moisture. Causes loss of color and must be redyed or resectioned.

**Copy Toner**

Toner consists of tiny insoluble particles that must be vacuumed out. Any remaining toner should be lubricated and suspended with a VDS.

**Floor Finish**

Unfortunately the staff that strips the VCT may be different from the carpet cleaners and leave a strip of floor finish on the carpet. Use an alkaline prespray with heat, dwell time, acid rinse.

**Gum**

Freeze and chip or use a gel based POG allow it to dwell then extract. *Finally if the spot comes back you have wicking. Use a poultice.*
## Spotting Chart

<table>
<thead>
<tr>
<th>Volatile Dry Solvent VDS</th>
<th>Non Volatile NVDS POG</th>
<th>Citrus Gel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ink</td>
<td>Nail polish</td>
<td>Gum</td>
</tr>
<tr>
<td>Fresh paint</td>
<td>Lipstick</td>
<td>Lipstick</td>
</tr>
<tr>
<td>Grease</td>
<td>Glue</td>
<td>Glue</td>
</tr>
<tr>
<td>Carbon</td>
<td></td>
<td>Can be used in place of NVDS when delamination is possible.</td>
</tr>
<tr>
<td>Shoe polish</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rinse for NVDS</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>VDS is for minor solvent soluble spots if spot is heavy go to NVDS.</strong></td>
<td><strong>Be careful of delamination.</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Neutral Detergent NDS</th>
<th>Alkaline Detergent ADS</th>
<th>Acid/Tannin Spotter AS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor water soluble spots</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Preconditioner will remove same spots during cleaning.</strong></td>
<td><strong>Preconditioner will remove same spots during cleaning.</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Enzyme/Protein Spotter</th>
<th>Rust Remover</th>
<th>Oxidizer/Reducer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Old food</td>
<td>Rust</td>
<td>Dye stains</td>
</tr>
<tr>
<td>Blood</td>
<td></td>
<td>Wine</td>
</tr>
<tr>
<td>Old milk</td>
<td></td>
<td>Furniture Stain</td>
</tr>
<tr>
<td>Old urine</td>
<td></td>
<td>Mustard</td>
</tr>
<tr>
<td>Gravy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vomit</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Apply cool and allow plenty of dwell time</strong></td>
<td><strong>Be sure to neutralize and rinse. Can cause burns and etch glass.</strong></td>
<td><strong>These products can also remove carpet color. Use caution.</strong></td>
</tr>
</tbody>
</table>

Remember to pretest your spotters and follow directions.

Experiment at home not in your customer’s building.

Use only enough spotting solution to suspend the spot.

**Mixing chlorine bleach with ammonia forms toxic chlorine gas.**
Additional chemicals

Deodorizers – odors are triggers. Smells may be experienced as negative, positive or neutral. If we react negatively to an odor we are provoked to a behavior that reduces or removes the odor. A favorable scent leads us to a positive or pleasant reaction.

In our industry we have a variety of deodorizers.

- **Scents** are products that only add a perfume to the air and have no other quality other than masking. This will not destroy a bad odor. Once the scent has evaporated the malodor will return.
- **Odor neutralizers** contain essential oils that attract malodorous molecules and neutralize them.
- **Microorganisms** are natural fungi or bacteria used to destroy urine-based odors.
- **Biocides/sanitizers/disinfectants** kill specific bacteria or sanitizes to a level of public acceptance.
- **Oxidizers** such as ozone, chlorine bleach, or hydrogen peroxide burn up odors.

Principles of Deodorization

Regardless of the cause of the odor the following principles must be followed or the smell will return.

1. Eliminate the source.
2. Clean all surfaces.
3. Recreate the conditions of penetration.
4. Seal materials that cannot be thoroughly treated or removed.
Tools for odor detection

Moisture Sensor

UV Light

Sub Surface Extractor

Fogging
Defoamers

Products designed to eliminate foaming problems in hoses and extractors. It is available in powder or liquid form. Due to silicone formula defoamers are not designed to be applied directly to carpet. This may cause resoiling. Add defoamer directly to vacuum hose at the hose cuff nearest the wand. If using a portable extractor add it to the recovery tank also.

Antistats

Most nylon fibers have a built in carbon core fiber that reduces or dissipates the static charge.

- Static problems usually occur in times of low humidity, normally winter.
- Antistatic products are available to spray on a clean carpet to dissipate the static charge.
- Most antistats are silicone-based

Soil & Stain protectors

- Soil retardants – filled in crevices of the fibers with Colorless particles to prevent soil from attaching. Carpets became stiff.
- Silicones – great water repellency but not very effective on oil or dry soil. Starting in 1986 voided stain-resist warranties. Many silicones cause rapid resoiling.
- Fluorochemical – the 2 most recognized trade names are 3M Scotchgard and Dupont Advanced Teflon. They improve stain and soil resistance by lowering the surface energy of the fabric and creating a barrier.
  - Solvent – better oil and water repellency.
  - Water – better dry soil repellency and durability.
- Factors effecting its performance
  - Concentration of chemical applied.
  - Surface of the material, the flatter the better.
  - Grooming the carpet helps the penetration.
  - Fabric should be residue free.
Review #7
Chemicals & Spotting

1. The workhorse of cleaning products is the ________________.

2. A(n) __________ detergent is used on soiled synthetic fabrics.

3. A(n) ________ _______ is the best choice for neutralizing a preconditioner.

4. For all synthetic carpet the safest pH to use is under _____.

5. A ________________ repels all three types of soils.

6. A gallon contains _____ ounces.

7. A spot adds __________ to the carpet, a stain adds ________.

8. Asking the customer, noting the ______________, and using your __________ help to identify the spot.

9. A(n) _________ adds oxygen to a spot a reducer ________ oxygen.

10. Use solvents that have a high _______ _______ and be sure to __________ the area.

11. To remove a coffee spot use a ________ spotter.

12. When using rust removers __________ and __________.

13. Acne medicines contain ________ ________ which can bleach fabric.

14. _________ spotters need heat, _________ and longer dwell time.

15. Nail polish, lipstick or paint will need a _ _ _ to remove.
Maintenance Programs

Designing and implementing a maintenance program accomplishes 6 goals.

1. The carpet always has a high appearance level.
2. Control and removal of pollutants should create a healthier environment.
3. The life cycle costing of the carpet has been improved.
4. The client is happy.
5. You have removed the competition from bidding.
6. You have increased the value of your company.

When you are designing the maintenance program you must view the building in a holistic manner. When you go to a doctor for back pain he may examine your entire body to identify what is causing the back pain. The carpeted floor is just one part of the entire building that can be affected by the outside areas or the HVAC system. Your job is to stop the progressive accumulation of soil and clean the areas before it reaches unacceptable levels. This extends the carpet life and creates a cleaner, healthier environment.

Is the carpet worth an investment in a maintenance program? Olefin glue down with a 3-year life expectancy will not get the same consideration as a solution-dyed nylon carpet module installation. The best time to establish a plan is before or when the carpet is just installed.

The initial conversation with the facility manager will cover these questions:

1. What are the goals for the carpet – will the projected budget be enough to attain the goals. How many years do they expect to get from the carpet?
2. What type of fiber, dye system, construction and backing?
3. Was the carpet installed over cushion?
4. What type of installation?
5. What is the current condition of the carpet?
6. What is the current maintenance? How effective has it been?
7. What factors may affect the program?
   a. 24 hour facility
   b. special soiling problems
      i. printing plant
      ii. swimming pool


Inspection

1. Start in the parking area. If the parking area is loaded with oil, grease and antifreeze, it will eventually work its way onto the carpet.
2. How are the walkways and entryways? Are they swept or even better ever power washed?
3. What is the matting program?
   a. Outside mats
   b. Interior mats (is it stationary)
   c. Size and length
   d. Maintenance of the mats
4. Hard surface floors at the entryway.
   a. How is the maintenance of the hard surface?
   b. Has finish splashed on the carpet?
5. What is the vacuuming program?
   a. How often?
   b. How many passes in high traffic areas?
   c. Type of vacuums and maintenance of vacuums.
6. What is the spotting program?
   a. How often?
   b. Types of chemicals?
   c. Who performs the spotting?
   d. Are the chemicals rinsed?
7. Determining traffic areas
   a. Low
   b. Medium
   c. High
   d. Problem spotting areas
8. Identify funnel areas, elevator lobbies, stair case landings, pivot points, vending machine areas, and cafeteria entries.
9. Identify residue or optical brightener damage. Residue from heavy absorbent compound cleaning can be difficult to remove.
10. Identify any carpet problems
    a. Seams
    b. Yellowing
    c. Rippling
    d. Delamination
    e. Color loss
Maintenance recommendations

Once you have completed your thorough inspection of the entire building inside and outside and reviewed the current and past maintenance you are ready to give your plan. Ideally you can obtain a copy of the building blueprints or you may design your own. Color-code the blueprint with the cleaning frequencies. These frequencies are determined by the expectations of the building management, traffic load, and the preventative maintenance in place. Separate plans for vacuuming, interim maintenance and restorative cleaning may be designed. Place a copy in your office, the tech should have one and the building contact should have one. Every conversation with the building contact should be recorded in the book and copies given to everyone. Every problem begins with poor communication. Remember every part of the program is important. **Neglecting one part can affect the whole building.** High traffic areas without a maintenance program can suffer from premature yarn distortion.

![Building blueprint]

Your cleaning process will now be broken down into 3 areas:

1. Daily vacuuming, spotting
   a. High traffic areas
   b. Lobbies (protect marble or wood floors with drop cloths)
   c. Entries
   d. Track off from hard surfaces
   e. Walk off mats

2. Interim maintenance – spotting, absorbent compound, bonnet, dry foam, encapsulation
   a. Fast,
b. Low moisture – quick drying
c. Surface cleaning
3. Restorative cleaning – HWE, rotary shampoo
   a. Deep cleaning, better appearance
   b. More moisture – slower drying
   c. Less residue – lengthens carpet life

The frequency of restorative cleaning is highly dependent on the effectiveness of daily maintenance and interim cleaning processes, as well as traffic, carpet color, carpet location, use and exposure to soiling.

Procedures for cleaning in a commercial building (restorative)
1. Check out power, water, security numbers and the HVAC system.
2. Set up wet floor signs.
3. Remove and store furniture pads if required.
4. Vacuum traffic areas with upright vacuum with high filtration bag.
   Use a backpack vacuum in hard to reach areas. For heavily soil compacted areas use a pile lifter.
5. Precondition areas and allow proper dwell time. Use a rotary scrubber or counter rotating brush machine to provide additional agitation.
6. Use a portable, walk behind or truck mount extractor to rinse and flush preconditioner, pollutants and old residue from carpet.
7. Apply post-cleaning treatments as required.
8. Groom or brush carpet as necessary.
9. Replace, tab and block furniture.
10. Set up airmovers and adjust HVAC for good ventilation.
11. Review areas cleaned for any concerns, replace furniture and replace equipment in van.

Interim - Absorbent pad, Dry Foam, Absorbent compound
1. Check out power, water, security numbers and the HVAC system
2. Set up wet floor signs.
3. Open area cleaning does not require furniture or chair pad removal.
4. Vacuum traffic areas only.
5. Apply preconditioner if required.
6. If bonnet cleaning, change pad when it becomes soil saturated.
7. Absorbent compound - apply, agitate, allow dwell time, vacuum.
8. Dry foam – apply foam, agitate, extract.
9. Groom or brush carpet as necessary.
10. Review areas, process paperwork, communicate with office.
Problems and Solutions – a chance to show your skills

Browning

- Browning is caused by, overwetting, slow drying and cellulose material such as cotton and jute. It is accelerated by alkalinity. The culprit causing the problem is lignin, a naturally occurring gum. In the presence of moisture it breaks down and is transported to the surface. Most of the backings that are used today on tufted carpets are synthetic. The only way to have true cellulose browning is to have cellulose materials involved. On the rare occasion that you would encounter browning on a synthetic carpet it is much easier to remove. Normally because browning is caused by alkalinity it is cured by an acidic application. In the old days this was called souring. Today we use formulated browning formulas, acid rinses, mild reducers or hydrogen peroxide. Whichever product is chosen it should be lightly misted or applied to the tips only of the carpet.

Wicking

- A common misconception is that wicking is browning. Wicking is the upward migration of moisture in a fabric. The best analogy is that of a kerosene lantern. The oil wicks the bottom to the top of the wick and is lit. This process is referred to as capillary action. The difference between wicking and cellulose browning is the absence of cellulose in synthetic carpet. The discoloration found on the tips of synthetic carpets especially on olefin is soil. Due to the lack of dry soil removal prior to wet extraction soil, wicking is a major problem today. Overwetting and slow drying increase the chances of wicking. Wicking occurs in spotting situations when the residue of the contaminant or the spotter wicks to the surface during drying. If you suspect this may happen, the final step after rinsing is to apply a poultice of absorbent material such as paper towels to the top of the spot. Place a weight on top of ½ inch of paper towels and allow it to dry. The moisture and residue will continue to wick into the towels.

Yellowing - comes in many forms.

- BHT (butylated hydroxy toluene) is an antioxidant that has been used primarily in carpet cushion. It was believed to have been the cause of yellowing on carpet and its use has been discontinued in
the manufacturing of cushion. To remove dilute citric acid and spray and agitate on the tips of the carpet. Citric acid may dry to a harsh crystal and should be vacuumed and rinsed with an acid rinse.

- **Pesticides** – applied to the perimeter of the carpet may attack a primary color and cause a color change. This damage is permanent.
- **Optical brighteners** – reflect the blue-white part of light. Use of OB’s on carpet may cause a permanent yellowing.
- **Nitrogen Dioxide** – loss of the blue or red dye from incomplete combustion may cause permanent yellowing.
- **Ozone** – attacks the blue dye and may leave a permanent yellowing.
- **Soiling** – soil can cause yellowing especially on blue or gray carpet. Cleaning using maximum soil suspension can remove yellowing.
- **Tracked in oils** from parking lots, warehouses etc. Maximize soil suspension.

**Soil Filtration**

- The name aptly describes the problem. The microscopic particles of soil that continuously float in the air are filtered by the fibers usually along the perimeters of the room and under closed doors. Much of this soil is carbon and other non-soluble forms of soil with an oily residue that only complicates the removal. Removal will once again use the principles in an aggressive manner. Staining may be permanent.
  - Thorough vacuuming by hand.
  - Specially designed chemical or aggressive preconditioner heated if possible.
  - Hand agitation or tamping brush.
  - Hottest rinse extraction possible.
  - Groom & dry.

**Fume fading**

- Loss of color in carpet due to atmospheric pollutants such as ozone and NO2 passing through fibers. May not be apparent until soil filtration is removed.
  - Permanent damage

**Streaking**

- Clean or dirty streaks in carpet caused by:
  - Improper wand stroking
  - Blockage of vacuum slot or T-jets
  - Wicking
  - Improper preconditioning (clogged sprayer tip)
1. A maintenance program helps to extend the _______ of the carpet.

2. Mats should be used both ___________ & __________ the building.

3. Elevator lobbies, stair case landings, pivot points, vending machine areas are all considered to be_______ _________ areas.

4. ___________ one part of the building can affect the whole building.

5. A ___________ helps in designing your maintenance plan.

6. Identify the ________, medium and high _________ _________.

7. Make sure you know when the ____ ____ ____ system turns off.

8. Locate __________, __________ and security system before the job.

9. Before starting the job set up your _______ signs.

10. To set up a thorough maintenance program you must view the building in a ____________ manner.

11. Maintenance programs include ____________ , interim and ____________ programs.

12. 24 hour facilities may require _____ _________ methods.

13. Interim methods normally have higher _______________.

14. Mats require regular _________ or they become a soiling source.

15. If you have a power problem report it immediately to your ______________.
# REVISED RULES AND REGULATIONS FOR IICRC

## CERTIFICATIONS AVAILABLE BY EXAMINATION

- **ACADEMIC**: All course examinations must be passed with 75% or higher to achieve certification.

<table>
<thead>
<tr>
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**Prerequisites**:
- Prerequisites: IICRC Certification in CCT or CCMT, and UFT
- Prerequisite: IICRC Certification in FCT
- Prerequisite: IICRC Certification in WRT
- Prerequisites: AMRT; and HST or an OSHA 10 hour General Industry Health and Safety course, or other suitable program subject to IICRC approval; and one year verifiable microbial remediation experience after the date of issuance of the AMRT certification; and one of the following within one calendar year immediately before AMRS qualification: 10 verifiable microbial remediation projects or 1000 hours verifiable microbial remediation experience. Verification is by written Witness Statement under penalty of perjury plus an appropriate Project Sheet(s).
- Prerequisite: IICRC Certification in CCMT or CCT
- Prerequisite: IICRC Certification in ISSI.

**Approved by committee**
- Inspector status will not be awarded until such time these reports are approved by the Inspector Committee.

**Notes**
- Inspector status will not be awarded until such time these reports are approved by the Inspector Committee.
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• Prerequisite: IICRC Certification in ISSI. During the first year after passing the IICRC inspector exam, the individual is required to submit a minimum of ten (10) inspection reports which will be reviewed by the Inspector Committee. Inspector status will not be awarded until such time these reports are approved by committee.

**CERAMIC TILE INSPECTOR**

- Prerequisite: IICRC Certification in ISSI. During the first year after passing the IICRC inspector exam, the individual is required to submit a minimum of ten (10) inspection reports which will be reviewed by the Inspector Committee. Inspector status will not be awarded until such time these reports are approved by committee.

**WOOD LAMINATE FLOORING INSPECTOR**

Exam 851 & 852

- Prerequisite: IICRC Certification in ISSI. During the first year after passing the IICRC inspector exam, the individual is required to submit a minimum of ten (10) inspection reports which will be reviewed by the Inspector Committee. Inspector status will not be awarded until such time these reports are approved by committee.

**FIRE & SMOKE RESTORATION TECHNICIAN**

Exam 901

ADVANCED DESIGNATIONS  (NO EXAMINATION)

**JOURNEYMAN TEXTILE CLEANER**

Twelve (12) months active service in the industry after original certification date, plus attainment of specific designations as listed below. Designation will automatically be awarded upon attainment of the proper credits.

- Certification in (CCT or CCMT) and UFT and either (OCT, CRT or RRT)

**JOURNEYMAN FIRE & SMOKE RESTORER**

Twelve (12) months active service in the industry after original certification date plus attainment of specific categories as listed below.

- Certification in UFT, OCT and FSRT

**JOURNEYMAN WATER RESTORER**

Twelve (12) months active service in the industry after original certification date plus attainment of specific categories as listed below.

- Certification in (CCT or CMT), WRT and RRT

**MASTER TEXTILE CLEANER**

A minimum of three (3) years after original certification date plus attainment of specific certifications as listed below.

- Certification in (CCT or CCMT), UFT, OCT, (RRT or BRT) and CRT

**MASTER FIRE & SMOKE RESTORER**

A minimum of three (3) years after original certification date plus attainment of specific certifications as listed below.

- Certification in (CCT or CCMT), UFT, OCT, FSRT and (HST or equivalent)

**MASTER WATER RESTORER**

A minimum of three (3) years after original certification date plus attainment of specific certifications as listed below.

- Certification in (CCT or CCMT), RRT, WRT, ASD, AMRT/S and (HST or equivalent)

**IICRC TESTING FEE STRUCTURE**

| All Technician Exams (excluding AMRT & Inspector): | $65.00 |
| AMRT and INSPECTOR: | $150.00 |
| Retest: | $25.00 |

**RETESTING**

If technician doesn’t pass an exam and wishes to retake, there will be a fee of $25. Only two retakes are allowed. Exam must be retaken within 90 days of receiving test results otherwise re-attendance will be required before testing can be done again.

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ANNUAL REGISTRATION FEE

After one (1) year, registrant will receive annual renewal billing. If certified in 1 or 2 categories, fee will be $30 annually, 3 and 4 categories is $40 and 5 or more categories is $50 annually. Master status will be an additional $10.00. Applied Microbial Remediation certification will be $60.00 annually. If registrant lets certification lapse for a period of over twelve (12) months, he or she will be required to re-attend an approved school, retake exam and pay appropriate fees. If registrant wishes to reinstate certification within the twelve (12) month period, outstanding fees and fulfillment of continuing education credits will be required. Registrants must follow the Code of Ethics or be subject to sanctions up to and including loss of certification.

CERTIFIED INSPECTOR: Once the inspector has passed the probationary requirements, he or she may choose to be listed as “Practicing” or “Credentialed”. Practicing inspectors will pay $80.00 annually for fees with listing on the #800 IICRC Referral System and the web site, while Credentialed will pay $40.00 per year with no listing.

CERTIFIED FIRMS: A Certified Firm Application Request Form must be requested and returned to IICRC with a nonrefundable $25.00 processing fee. Upon approval of the request form, the firm will be sent Application for Certified Firm. The Application for Certified Firm must be forwarded to headquarters with the annual fee of $125.00. This is a separate fee from the $25.00 processing fee and is also nonrefundable. Once Certified Firm status is granted, the firm is immediately listed on the #800 IICRC Referral System as well as the IICRC web site at www.iicrc.org. The Certified Firm is also eligible at this time to use the registered trademark for advertising purposes.

THE IICRC RESERVES THE UNQUALIFIED RIGHT TO CHANGE AND REVISE THE POLICIES, PROCEDURES AND REQUIREMENTS.

You may review the Privacy Policy at www.iicrc.org/privacypolicy

Revised 03/08
CERTIFIED FIRM APPLICATION REQUEST FORM

Name: ___________________________ Title: ___________________________

Company Name: ___________________________

Company Address: ___________________________

City: ___________________________ State/Prov: ___________ Zip/Postal Code: ___________

Country: ___________________________ E-Mail: ___________________________

Phone: ___________________________ Fax: ___________________________

If you know the names of IICRC Certified Technicians currently employed by the firm, please list their names here:

_________________________________________  ___________________________________________

_________________________________________  ___________________________________________

Request for Certified Firm Application fee is $25.00 (U.S. Funds) and must accompany this form. Fees are nonrefundable.

✓ Check or Money Order enclosed or:

✓ Visa  ✓ MasterCard  ✓ American Express

Account number: ___________________________ Expiration date: ___________ V-Code: ___________

Cardholder Name: ___________________________

Signature: ___________________________

Send fee along with this completed request form to:

IICRC
2715 East Mill Plain Blvd
Vancouver, Washington 98661

In addition to the application fee, the annual fee for Certified Firms status is $125 (U.S. funds) and must accompany your final application.

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If the firm does not meet the requirements to become an IICRC Certified Firm upon submission of this request, the pending application will be held for six months.

Process for becoming an IICRC Certified Firm

Firms must first fill out a Certified Firm Application Request Form and submit to IICRC headquarters with a non-refundable $25 application fee. The Certified Firm Application Request Form is included with these instructions.

Once the request form is received and reviewed to make sure the Certified Technicians are still with the firm and have a current registration, the firm will be sent a Certified Firm Application and Code of Ethics.

The firm must sign and return a completed application and the IICRC Certified Firm Code of Ethics, along with a copy of its business license (if applicable), proof of insurance, and a non-refundable $125 for the first year’s registration fees.

If a firm does not meet the requirements to become an IICRC Certified Firm upon submission of a Certified Firm application, the pending application will be held for up to six months. During this period, the firm is allowed to take the necessary steps to meet the requirements.

All Certified Firms will have a common anniversary date of December 1 of each year. The first annual renewal bill will be prorated based on the acceptance date of the original registration. For example, if the firm became registered on June 1 of the year at which time it paid the $125 annual registration, the annual renewal bill in November would be $63.00. Thereafter, the annual renewal bill will be equal to the full annual renewal amount set by the IICRC Board of Directors.

When a firm is 90 days delinquent on its fees, the firm will be dropped from the roster. The firm may be reinstated when requirements are met and fees are paid.

Certified Firms are not eligible to order supplies or receive Certified Firm credentials until such time they meet all requirements.

Only Certified Firms may display the registered trademark.
APPLICATION FOR IICRC CONTINUING EDUCATION CREDITS

Name ___________________________ Date ___________________

Company ________________________ Register # ______

Address __________________________ Phone (______)

City __________________ State ______ Zip/Postal Code ______

Event Date __________________ Event Sponsor __________________

Event Description __________________

Application must be signed by an authorized individual such as School Instructor, Association President, Executive Administrator or a pre-approved individual.

Sign __________________ Print Name __________________

Title __________________ Date __________________ Phone (______)

********************************************************************************************************************************************************************************************************

APPROVED EVENT

Attendance at Approved Schools.

Attendance at Association sponsored Conventions, Workshops, Seminars, Chapter Meetings, and other educational functions as pre-approved.

Attendance at supplier sponsored seminars as pre-approved.

Attendance at Carpet Markets and or Carpet Market workshops.

Attendance at other IICRC pre-approved functions.

********************************************************************************************************************************************************************************************************

RULES

All applications for credits must be witnessed by the sponsoring organization. This can be accomplished by signature of organization official or submission of a verified attendance form from the organization.

All applications must be submitted on the official IICRC application form which requires signature of an organization official.

Applications for approval of events must be made on the IICRC official form, in writing and presented to IICRC 30 days prior to the date of the event. No exceptions will be made.

Applications for approval will be processed by the IICRC Registrants Standards Committee. No other authorization will be accepted.

All requests must be mailed to IICRC headquarters.

COPIES CAN AND SHOULD BE MADE OF THIS APPLICATION FOR FUTURE USE.
Review #1
Fibers

1. Natural fibers are very absorbent which means they absorb dye easily, stain easily, and take longer to dry.

2. The most popular synthetic fiber is nylon.

3. Olefin loves oil and hates water.

4. Wool and silk are examples of protein fibers.

5. Nylon can be dissolved by formic acid.

6. Wool will not burn and smells like a wet dog when wet.

7. The epidermis of a wool fiber can be damaged by alkalinity.

8. Bleach can dissolve a wool or silk fiber.

9. Polyester is not a good choice for a commercial building.

10. Olefin is always solution dyed but melts easily.

11. All synthetic fibers are extruded through a spinneret.

12. The acrylic fiber is a synthetic substitute for wool.

13. Nylon is attracted to acid dye stains and should be cleaned with a pH under 10.

14. When a synthetic fiber is burned it leaves a hard bead when a natural fiber is burned it leaves an ash.

15. The two most popular fibers for commercial carpet are nylon and olefin.
Review #2
Yarns & Dyeing

1. Synthetic fibers are created through a process called extrusion.

2. Synthetic fibers can be either filament or cut into staple.

3. Loose staple fiber is normal in a cut pile and called shedding.

4. Olefin can be damaged by hot couplers and friction.

5. Olefin is attracted to oily soils, this is referred to as being oliophilic.

6. Bulked continuous filaments are referred to as BCF.

7. When 2 or more yarns are twisted together they have been plied.

8. A carpet that is dyed in a pattern is called a printed carpet.

9. A carpet that has not been dyed is called greige goods.

10. Olefin fibers must be solution dyed.

11. Wool cannot be solution dyed.

12. A pigment is insoluble, a dye is soluble.

13. Optical brighteners can cause permanent yellowing, and void carpet warranties.

14. Pooling, watermarking, and shading are characteristics and are not considered defects by the carpet manufacturers.

15. Bleeding requires water crocking requires agitation.
Review #3 Manufacturing & Styles

1. Woven carpet is made on a loom and the yarns consist of a warp yarn a weft yarn and a face yarn.

2. A tufted carpet consists of a face yarn stitched in to a primary backing with latex bonding it to a secondary backing.

3. Most tufted carpet has a synthetic backing but some woven carpet has cotton or jute yarns which can shrink.

4. The number of tufting needles across the width of the tufting machine is referred to as the gauge.

5. Glue down level loop carpet can be difficult to clean because of the cleaning wand bouncing and excess moisture and soil wicking.

6. An inexpensive cushion will cause the carpet to crush.

7. A few styles of commercial carpet have an attached cushion.

8. All stretched in carpet must be installed using a power stretcher.

9. The CRI Standard for installation of commercial carpet is called CRI 104.

10. Tufted carpet must have enough latex to hold the yarns in and can be damaged by excessive use of solvents.

11. The separation of primary and secondary backing is called delamination.

12. Seam sealer prevents the seams from separating.

13. A stretch in carpet that ripples normally settles when dry.

14. Be careful with solvents on direct-glue carpet.

15. Download CRI installation standards from www.carpet-rug.org
Review #4
Soiling & Principles

1. Soil is normally **acidic** on the pH scale.

2. The highest percentage of soil is **insoluble**.

3. The best way to remove dry soil is by **vacuuming**.

4. Soil shading is caused by **abrasion** of plastic fibers.

5. The principle of **dry soil removal** is frequently skipped.

6. The cleaning pie consists of **Time**, **Agitation**, **Chemical**, and **Temperature**.

7. The second principle is **soil suspension**.

8. Extraction can include **vacuuming**.

9. Water soluble soils cannot be removed by **solvents**.

10. Hair, sand and skin are considered **insoluble**.

11. Empty a vacuum bag when it is 1/2 to 2/3 full.

12. A micron or micrometer is 1 **millionth** of a meter.

13. Fast drying prevents **slip and fall** hazards.

14. A carpet should be groomed to remove **wand marks** and help the protector be **distributed** evenly.
15. The technician is responsible for over wetting. Some of this may be caused by lack of equipment maintenance.

Review #5

Methods

1. Regardless of the method chosen the principles must be followed.

2. The oldest method is rotary shampoo.

3. A very popular method for commercial maintenance is absorbent pad.

4. Hot water extraction has the most chances of overwetting.

5. Systems using a granular detergent are called adsorbent compounds.

6. A system using a foaming surfactant using a cylindrical brush is called dry foam.

7. The method favored by many carpet manufacturers is HWE.

8. When using an absorbent pad the pad should be changed when it stops absorbing soil.

9. Systems using rotary action may cause fiber distortion.

10. Propane tanks should be mounted on the outside of the van.

11. All trucks must carry MSDS, and a fire extinguisher.

12. Replace any plugs that are cut or missing the ground.

13. Replace any solution hoses that are worn.

14. Park your van so that exhaust faces away from the building.

15. Wicking is minimized in a commercial building with multiple spills when using an encapsulation system.
Review #6
Chemistry

1. The pH chart ranges from 0 to 14 with 7 being neutral.

2. Any water based solution below 7 is acid above 7 is alkaline.

3. A surfactant allows penetration into the fabric being cleaned.

4. A builder adds alkalinity and softens water while emulsifying oily and greasy soils.

5. Hydrophilic loves water hydrophobic hates water.

6. A surfactant resembles the candy tootsie roll pop.

7. Soaps do not work as well as detergents in hard water.

8. The universal solvent which dissolves the most substances is water.

9. The pH of toothpaste is on the alkaline side of the pH scale.

10. The pH of a browning removal product is on the acidic side.

11. Rust is considered alkaline so to remove use an acidic product.

12. Most disinfectants contain cationic surfactants.

13. Mixing a cationic surfactant with an anionic surfactant will make a gooey mess.

14. A dilution rate of 1:4 means you add 1 part chemical to 4 parts water.
15. Most preconditioners are **alkaline** because most soil is **acidic**.

**Review #7**

**Chemicals & Spotting**

1. The workhorse of cleaning products is the **preconditioner**.

2. A(n) **alkaline** detergent is used on soiled synthetic fabrics.

3. A(n) **acid rinse** is the best choice for neutralizing a preconditioner.

4. For all synthetic carpet the safest pH to use is under **10**.

5. A **fluorochemical** repels all three types of soils.

6. A gallon contains **128** ounces.

7. A spot adds **substance** to the carpet, a stain adds **dye**.

8. Asking the customer, noting the **location**, and using your **senses** help to identify the spot.

9. A(n) **oxidizer** adds oxygen to a spot a reducer **removes** oxygen.

10. Use solvents that have a high **flash point** and be sure to **ventilate** the area.

11. To remove a coffee spot use a **tannin** spotter.

12. When using rust removers **neutralize** and **rinse**.

13. Acne medicines contain **benzoyl peroxide** which can bleach fabric.

14. **Enzyme** spotters need heat, **water** and longer dwell time.

15. Nail polish, lipstick or paint will need a **POG** to remove.
Review #8
Maintenance Plans & Procedures

1. A maintenance program helps to extend the life of the carpet.

2. Mats should be used both outside & inside the building.

3. Elevator lobbies, stair case landings, pivot points, vending machine areas are all considered to be high traffic areas.

4. Neglecting one part of the building can affect the whole building.

5. A blueprint helps in designing your maintenance plan.

6. Identify the low, medium and high traffic areas.

7. Make sure you know when the HVAC system turns off.

8. Locate water, electric, and security system before the job.

9. Before starting the job set up your warning signs.

10. To set up a thorough maintenance program you must view the building in a holistic manner.

11. Maintenance programs include preventative, interim and restorative programs.

12. 24 hour facilities may require low moisture methods.

13. Interim methods normally have higher productivity.

14. Mats require regular cleaning or they become a soiling source.

15. If you have a power problem report it immediately to your supervisor.