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COMMERCIAL CARPET MAINTENANCE TECHNICIAN (CCMT)

This certification is designed as an academic and practical assessment of commercial carpet and maintenance processes and procedures.

Emphasis will be placed on teaching the ANSI/IICRC S100 Standard for Professional Cleaning of Textile Floor Coverings, carpet cleaning methodologies, safety procedures, and developing standard operating procedures for individuals who will perform these procedures in the field.

Course graduates will have a basic understanding of the importance of preventative, daily, interim, and deep cleaning and how they contribute to the overall success of the commercial carpet maintenance program.



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COMMERCIAL CARPET MAINTENANCE TECHNICIAN (CCMT)




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BEFORE THE CERTIFICATION COURSE- REGISTRATION



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SECTION 1 OVERVIEW

Product

- Understanding carpet fibers and characteristics
- Fiber Identification
- Yarn Preparation
- Heat Setting
- Denier - Yarn size
- Dyeing
- Carpet Manufacturing
- Face Fiber and Yarn Styles
- Backing Styles
- Carpet Installation



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SECTION 1 OVERVIEW

carpet - A textile floor covering that may be wall-to wall and fastened to the floor. Can refer to rugs that are larger than 8 x 10 feet (274 cm x 366 cm) as "carpet" IICRC R100



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CARPET FIBER TYPES: NATURAL

Cellulosic & Grasses

- Cotton
- Jute
- Sisal
- Sea Grass

Protein-Based

- Wool
- Silk



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CELLULOSIC AND GRASSES

Cotton

- Plant-based fiber
- Mostly used in specialty rugs
- Use extra caution when cleaning
- Highly flammable
- Subject to cellulosic browning



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CELLULOSIC AND GRASSES

Jute

- Long & shiny fiber that can be spun into coarse, strong threads
- Affordable
- Variety of uses
- Composed primarily of the plant materials cellulose and lignin
- Most often used in the structural process of woven carpet and rugs
- Cellulose browning can occur during cleaning






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CELLULOSIC AND GRASSES

Sisal

- Comes from the leaves of the Agave Sisalana tree in Mexico
- Very coarse
- Very susceptible to staining, including water marking
- Used in high-end office rugs and walk-off mats

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CELLULOSIC AND GRASSES

Sea Grass



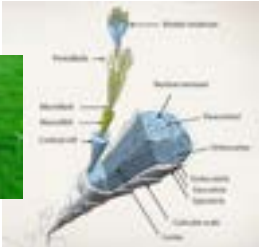

- Popular for rugs and walk-off mats
- Shiny and smooth compared to Sisal
- From grasses that grow in seas and the oceans




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PROTEIN BASED: WOOL

In the United States, wool is the most common of the **natural fibers** used in carpet

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PROTEIN-BASED: WOOL

Pros

- Naturally flame-resistant
- Most resilient of all fibers
- Wool hides soil-it's opaque
- Good abrasion resistance
- pH is around 5.5

Cons

- High alkalinity can damage the epidermis (the outer layer)
- Stains difficult to remove
- Bleeding and crocking can occur



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PROTEIN-BASED: SILK

- Spun from a 'silkworm' cocoon
- Only continuous filament natural fiber
- Slightly weaker when wet
- Discolors easily
- Non-resiliency requires careful extraction and drying



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CARPET FIBER TYPES: SYNTHETIC



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VISCOSE

- Semi-synthetic type of rayon fabric made from wood pulp
- Commonly used as a silk substitute



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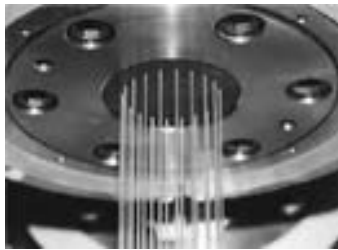
NYLON

Type 6.6, Nylon

- Adipic acid and Hexamethylene diamine, these two compounds that form a salt known as nylon

Type 6.0, Nylon

- Caprolactam



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NYLON 6.0 & 6.6

Pros

- Most abrasion resistant of all synthetic fibers
- Light weight and very strong
- Strength doesn't diminish over time
- Most resilient fiber (has memory)
- Easily dyed
- Relatively high melting point
- Resistant to mildew and insects
- Not oleophilic

Cons

- One of the easiest fibers to stain
- Usually more expensive than polyesters and olefins
- Higher pH cleaners will remove the soil protection treatment
- Lower pH cleaners can affect the dyes



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OLEFIN AND POLYPROPYLENE

- Olefin or polypropylene is a polymer of ethylene (C²H⁴)
 - Only slight difference in the chemistry of olefin and polypropylene
- Very popular in the residential market due to its cost



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OLEFIN AND POLYPROPYLENE

Pros

- Most economical synthetic fiber
- Chemically inert, no reaction to acid or alkaline
- Solution-dyed, will not bleach out
- Most stain resistant
- Least water absorbent
- It has a specific gravity of 0.91, (it floats on water)

Cons

- Lowest melt temperature of any fiber.
- Friction can leave permanent damage
- Affected by normal wear and abrasion
- Traffic patterns will become evident due to the scratches on the surface of filaments
- Attracted to oily soils (oleophilic)



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POLYESTERS: POLYETHYLENE TEREPHTHALATE (PET)

- Both hydrophobic and lipophilic (water-hating and oil-loving)
- No dye blocker needed to resist water-based stains
- Primarily solution-dyed but can be dyed with cationic (basis) dye, making it a hydrophobic, cationic fiber



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POLYESTERS: POLYETHYLENE TEREPHTHALATE (PET)

Pros

- Fade resistant
- Resistance to water-soluble stains
- Can be made of recycled content

Cons

- Poor resiliency
- Attracted to oily soils



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TRIXTA POLY TRIMETHYLENE TEREPHTHALATE (PTT)

A portion of its raw materials come from corn glucose. This makes it a more environmentally friendly product.

Pros

- Similar resiliency and cleanability as nylon
- Abrasion resilience equal to nylon
- No static problems
- Equal to polyester in repelling acid dye stains

Cons

- Oleophilic
- Newer product - data isn't as complete as PET



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FIBER IDENTIFICATION



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FIBER IDENTIFICATION

Why is it important?

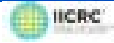
You need to ID the fiber in order to know what cleaning chemistry and what cleaning methodology can be safely used on the fiber being cleaned.



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FIBER IDENTIFICATION: CHEMICAL TESTING

- **Nylon:** Dissolves in formic acid, and will sink in water
- **Wool:** Dissolves in household bleach
- **Olefin:** Floats on water



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FIBER IDENTIFICATION: BURN TESTING




Do not inhale fumes or do burn testing inside!



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FIBER IDENTIFICATION: BURN TESTING

Fiber	Flame	Smoke	Odor	Ash
Cotton & Jute	Orange color, burns evenly, continues to glow	None	Burning paper	Irregular glowing ember, crumbles to powder
Wool	Orange, sputters out.	White if present	Burning hair	Irregular, black crumbles to fine powder
Nylon	Yellow-orange, burns evenly, does not sputter	None	Burning paper	Usually no ash left. Gray and powdery, if present
Clay	Blue base with orange tip, burns evenly and rapidly	Black if present	Asphalt/ tar	Round, hard bead. Tan to brown
Rayon	Orange and sputters.	Black	Sweet/irky	Round, shiny, black and hard
Acrylic	White-orange sputters and burns rapidly	Black	Burnt meat	Irregular, black with hard crust
Nylon	Blue base with orange tip and burns evenly	Usually none	Celery or wax	Round, hard bead, gray brown to black



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FIBERS

Bulk Continuous Filaments


- Run for indefinite lengths
- Man-made fibers, start out as continuous
- Silk is also continuous

Staple Filaments


- Short lengths
- Wool is about 6 inches to a foot
- Synthetics can be cut 6 to 8 inches




BCF FIBER




STAPLE FIBER



BCF YARN



STAPLE YARN



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UNDERSTANDING FIBER: DENIER

Large Denier Number


- Thicker filament
- More coarse feeling
- Improves the longevity of the yarn


Small Denier Number


- Softer touch


Denier Number Examples


- Panty hose: 6 denier
- Wool in carpet: 30 denier
- Commercial carpet: 1,000 - 2,000 denier











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UNDERSTANDING FIBER: BULKING

- Crimping is a way to create bulk in synthetic fibers
- The crimper is like a pair of gears that put a wrinkle in the yarn
- Yarns are twisted into plies to add strength



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UNDERSTANDING FIBER: HEAT SETTING

A manufacturing process of heating plied yarns to create a new permanent memory to retain their twists

There are three methods: Autoclave, Superba, and Suessen



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HEAT SETTING

Autoclave

- Best method
- Expensive
- Generally done on high-end carpets

Superba

- Mid-range method
- Often done on yarns with a high twist
- Less expensive than autoclave

Suessen

- Economical
- Many low-end carpets are heat set with this method



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UNDERSTANDING COLOR

Primary Colors

- Red
- Yellow
- Blue

Secondary

- Red + Yellow = Orange
- Blue + Yellow = Green
- Blue + Red + Violet

The diagram is a circular color wheel. At the top is 'Primary' with red, yellow, and blue. Moving clockwise: red and yellow mix to form orange (intermediate); yellow and blue mix to form green (intermediate); blue and red mix to form violet (intermediate). Further clockwise: red and orange mix to form red-orange; orange and yellow mix to form yellow-orange; yellow and green mix to form yellow-green; green and blue mix to form blue-green; blue and violet mix to form blue-violet. At the bottom are 'Tertiary' colors: red-orange, yellow-orange, yellow-green, blue-green, blue-violet, and violet. The wheel is labeled with 'Primary', 'Secondary', and 'Intermediate (tertiary)' at various points. The IICRC logo is at the bottom left of the wheel.

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UNDERSTANDING COLOR

Intermediate

- Blue-green
- Red-orange

Complementary

- Red and green
- Blue and orange

Tertiary

- Brown
- Black
- Gray

This diagram is identical to the one on slide 34, showing a color wheel with primary, secondary, and tertiary colors and their mixtures. The IICRC logo is at the bottom left.

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DYEING FIBERS

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ADDING COLOR TO THE FIBER

- **Types of dyes**
 - Acid
 - Basic
 - Dispersed
 - Specialty
- **Process of Dyeing**
- **Pre- and post- tufted**
- **Solution and yarn dyed**



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DYEING FIBER: TYPES OF DYES

Acid Dye

- Low pH
- Most common dye for nylon and wool

Basic Dye

- Used to dye cationic nylon, modified nylon, or acrylic under pressure (pressure beck dyeing)
- Bleeds in the presence of acids

Disperse Dye

- A dye that can dissolve in boiling water and bond with lipophilic, hydrophobic, or cationic fibers (e.g., dry solvent soluble)
- Common for polyester, acrylic, and cationic nylon
- Resistant to bleach but may fade due to atmospheric gases
- Bleeds in strong dry solvents

Specialty Dyes

- Dyed nylon carpet with special fluorescent dyes to produce visual effects
- Mostly found in entertainment venues



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CARPET: DYEING METHODS


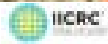
- **Pre-Dyed** : All yarns are dyed before tufting
 - Solution dyeing
 - Yarn dyeing
- **Post-Dyed**: Tufted carpet that is not dyed receives dye after tufting, but before the secondary backing is applied
 - Beck/Piece
 - Differential dyed
 - Continuous
 - Print



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TYPES OF PRE-DYED

Solution Dyeing
 Color chips are added to the liquid polymer before extrusion into filament

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TYPES OF PRE-DYED

Yarn Dyeing
 The process of applying a dye to the fiber and absorbing into the dye sites

Yarn Dying Types:

- Skein
- Space




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TYPES OF PRE-DYED

Yarn Dyeing: Skein

- Yarn is unwound from cokes to skeins
- Then it's mounted and immersed into a large hot dye vat






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TYPES OF PRE-DYED

Yarn Dyeing: Space

Several colors are printed along the yarn length to produce a tweed effect when tufted



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TYPES OF POST-DYED

Beck/Piece

Unfinished goods are sewn end to end, rotated through a heat dye bath until it reaches the desired color

Differential Dyed

Done in the same type of bath as Beck/Piece dyeing, only the carpet is tufted with chemically treated yarns that react differently to different types of dyes that are loaded into the bath




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TYPES OF POST-DYED

Continuous

Unfinished goods sewn end to end, fed flat through a trough filled with dye.



Continuous Dyeing



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TYPES OF POST-DYED

Print - dye is directly applied to the carpet in the form of a pattern



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CARPET MANUFACTURING



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MANUFACTURING STYLE OF CARPET CONSTRUCTION

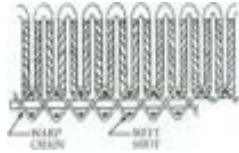
- Woven
 - Velvet
 - Wilton
 - Axminster
- Tufted
- Flocked
- Fusion
- Needle-Punched



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CARPET CONSTRUCTION: WOVEN

- **Velvet:** simple weave for dense plush pile, generally one color
- **Wilton:** woven Jacquard, allows for multi-colored patterns
- **Axminster:** ribbed appearance on back rolled only in one direction



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CARPET CONSTRUCTION: TUFTED

- **Face Yarns:** Synthetic (nylon, polyesters or olefin) and wool fibers
- **Primary Backing:** Usually polypropylene; woven or spun
- **Adhesive:** Layer of latex or hot melt adhesive
- **Secondary Backing:** Polypropylene, jute, vinyl, or foam



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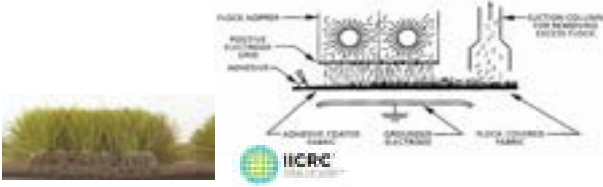
CARPET CONSTRUCTION: TUFTED



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CARPET CONSTRUCTION: ELECTROSTATICALLY FLOCKED

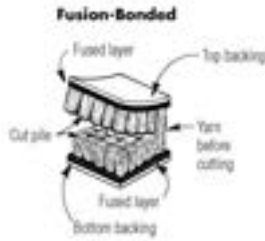
- Electrostatically spray fiber strands onto an adhesive-coated backing
- As the fibers become embedded, the fibers stand up vertically due to the charge applied
- Apply the secondary backing once set



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CARPET CONSTRUCTION: FUSION-BONDED

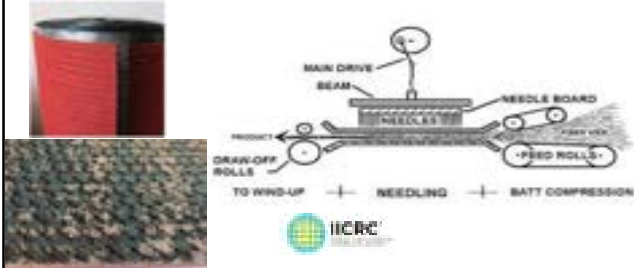
- Implants carpet yarns into molten vinyl, plastic or rubber adhesive to form the backing.
- Two rubber sheets receive an adhesive and single yarns are implanted into the rubber sheets.
- Adhesive cures, and the pile is produced by splitting two parallel sheets of face-to-face carpet down the middle of the pile.



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CARPET CONSTRUCTION: NEEDLE PUNCH

Filaments are randomly laid into a fabric. A needle punching machine (with hot barbed needles) punches the filaments into the fabric backing.



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TYPES OF CARPET CONSTRUCTION




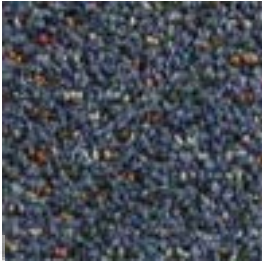

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CARPET CONSTRUCTION: FACE STYLES

Loop Pile
Face yarns that are uncut and form loops.

Types:

- **Level Loop** - a durable style of commercial carpet
- **Multi Level Loop** - a high/low mixture that gives a pattern to the carpet texture



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CARPET CONSTRUCTION: FACE STYLES

Cut Pile
Face yarns that are cut for an even smooth texture.



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CARPET CONSTRUCTION: FACE STYLES

Tip Shear

Face yarns that have been tufted with multilevel loops are then shaved to form an appearance of cut loops and loops.



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TYPES OF CARPET BACKING



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CARPET CONSTRUCTION: BACKING TYPES

Action Bac

By far the most popular of all backing types.



Unitary Backed



Secondary backing is heavy layer of latex.



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CARPET CONSTRUCTION: BACKING TYPES

Cushion Backed
Attached foam backing that can be used as broadloom or carpet tile



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CARPET CONSTRUCTION: BACKING TYPES



Vinyl Backed

- Most durable backing
- Found in both broadloom or carpet tile



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CARPET CONSTRUCTION: BACKING TYPES



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CARPET CONSTRUCTION: BACKING TYPES

Bitumen Backed
Popular in Europe, increasing popularity in the US

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TYPES OF INSTALLATION



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CARPET INSTALLATION

Direct-Glue
Apply adhesive to the floor and lay flooring onto it



Broadloom installation  **Carpet tile installation**

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CARPET INSTALLATION

Stretch-In
Strips of wood that have two rows of pins set in at an angle and are nailed to the floor. Carpet is stretched and attached.



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CARPET INSTALLATION

Double Stick
Apply carpet pad to releasable adhesive on the subfloor and then apply a flexible adhesive to the pad.



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CARPET INSTALLATION

Tab and Peel & Stick



Double adhesive tape **Factory applied adhesive**



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REVIEW

Which synthetic fiber will melt the quickest?
Answer: Olefin

Which dye method gives you the "carrot view" or through and through?
Answer: Solution-dyeing

What issue can occur when double-glue-down carpet is installed improperly?
Answer: Adhesive failure

Which fiber will float in water?
Answer: Olefin carpet fibers

What chemical can be used to test and check for wool fiber?
Answer: Use chlorine bleach

_____ is the most common synthetic pile fiber for commercial carpets.
Answer: Nylon



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REVIEW

The term resilience describes?
Answer: Carpet pile's ability to return to its original pile height after being compressed

Nylon fiber is mostly dyed using?
Answer: Acid dye

What is the carpet style that is easiest to replace?
Answer: Carpet tile

Print dyeing carpet, applies dyes where?
Answer: To the surface of the carpet pile, typically in a pattern

Wool fiber is susceptible to damage by?
Answer: Alkalinity

The absorbance of this fiber type can cause extended drying times
Answer: Natural

If a green - dyed carpet has a yellowish discoloration, what has been lost?
Answer: The blue component



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SECTION 2 OVERVIEW

SOIL

- What is soil
- The size of soil
- Indoor Air Quality
- Soil Composition
- Soil pH
- Soil Types



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WHAT IS SOIL?

“Any substance that is deposited on and foreign to the construction of a textile, usually as a result of wear and usage; e.g., particles, fibers, or water and dry solvent soluble substances”
- IICRC R100



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THE SOURCES OF SOIL

Approximately 80% of real soil is tracked in from exterior sources.
The other 20% is airborne.



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SOIL SIZE

Soil, along with others, can contribute to issues with indoor air quality.

- Examples:
- Molds
 - Bacterias
 - Pollens

Soil and other particulates that are under 10 microns pose a respiratory health risk when they become airborne



Photo retrieved on May 10, 2022, from www.visualcapitalist.com

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Slide 75

AAO Website?

Allie Allen, 2022-05-10T18:39:00.700

SOIL: INDOOR AIR QUALITY

Definitions

- **Indoor Air Quality (IAQ):** "A term used to describe the "purity" or quality of the air breathed by occupants of an indoor or enclosed environment."--S500
- **Indoor Environmental Quality (IEQ):** "A term used to describe the quality of the indoor or enclosed environment, including the purity of the air and the cleanliness or sanitary state of environmental surfaces or materials."--R100

Carpet traps and holds soil until it is removed, acting like a filter



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SOIL COMPOSITION



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SOIL COMPOSITION

DRY SOILS	WEIGHT (%)	WATER SOLUBLE	SOLVENT SOLUBLE	INSOLUBLE
Silica & Silicates	30 to 40%	No	No	Yes
Oxides, Carbonates & Phosphates	6 to 24%	No	No	Yes
Animal & Cellulose Fibers	20 TO 24%	No	No	Yes
Free Carbon	0 to 3%	No	No	Yes

Average content of 75%+

BINDING AGENTS	WEIGHT (%)	WATER SOLUBLE	SOLVENT SOLUBLE	INSOLUBLE
Resins & Gums	6 to 10%	No	Yes	No
Greases, Oils & Fats	3 to 8%	No	Yes	No
Moisture	2 to 4%	n/a	n/a	n/a

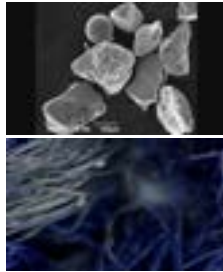
Average content of 25% per mass



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SOIL COMPOSITION: SILICA

- The largest and most damaging component of soil
- Vacuuming alone may not remove once it is below the carpet surface
- Can abrade the fibers causing permanent damage



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SOIL COMPOSITION: PARTICLE SOILS

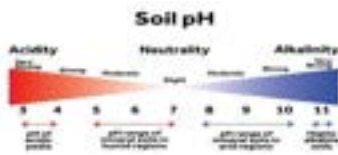
- Sand, clay, and fibrous materials from animals and plants
- Hydrophilic by nature
- Insoluble in water
- Do not chemically bond to the fiber by themselves



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SOIL COMPOSITION: PH OF SOIL

- Soil pH typically varies from 5.5 to more than 9.1
- Organic soil readings are typically from 6.1 to 6.7 pH



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SOIL COMPOSITION: GUMS, RESINS, AND BINDERS


Natures "sticky stuff", makes loose soil adhere to carpet fibers




Water can also be a binder

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SOIL TYPES



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UNDERSTANDING SOIL TYPES: REAL SOIL

Composed of unwanted substances that are foreign to the construction of the carpet

Significant Characteristics:

- Composition
- pH
- Size




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UNDERSTANDING SOIL TYPES: APPARENT SOIL

What appears to be soil may not actually be soil and is referred to as apparent soil. - S100

Apparent Soil Categories:

- Damage (e.g., Pile distortion, Fiber damage)
- Natural phenomenon (e.g., Pooling, shading, watermarking)

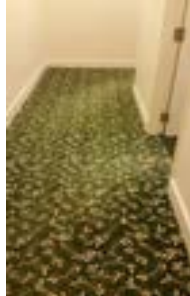


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UNDERSTANDING SOIL TYPES: APPARENT SOILING

Pile Distortion/Fiber Damage

- Can be misinterpreted as soiling
- Physical properties or characteristics of certain fibers that cannot be corrected with cleaning
- Not a real soil that can be removed by cleaning

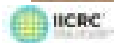


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UNDERSTANDING SOIL TYPES: APPARENT SOILING

Pooling

- Pile reversal forms serpentine lines
- Permanent condition caused by unknown forces
- Seen on high density saxony and velvet plush
- Not a real soil
- Can't be removed by cleaning



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UNDERSTANDING SOIL TYPES: APPARENT SOILING

Watermarking

- Optical effect caused by slight reorientation of fibers
- Appears in dense pile carpet when installed on slightly irregular subfloors
- Manifests itself as an irregular light/dark contrast in the pile
- Not a real soil
- Can't be removed by cleaning



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UNDERSTANDING SOIL TYPES: APPARENT SOILING

Shading

- An apparent change in carpet pile color caused as light is reflected in different ways when fibers are bent or abraded
- Aggravated when carpet fibers are subjected to abrasive soil and heavy traffic
- Not a defect, but a characteristic especially of cut-pile fabrics
- Not real soil that can be removed by cleaning



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UNDERSTANDING SOIL TYPES: IMAGINARY SOIL

- Can ONLY be seen by the consumer
- Can often be due to a lack of professionalism
- Imaginary soil can be avoided with:
 - Punctuality
 - Clean uniforms & vehicles
 - Well maintained equipment



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**SOIL
REVIEW**

_____ is any unwanted matter in the carpet
Answer: Real soil

Anything that changes the appearance of the carpet that is not real soil is _____
Answer: Apparent soil

What amount of soil is insoluble?
Answer: 74 - >75%



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**SOIL
REVIEW**

Soil and other particulates that are under _____ microns pose a respiratory health risk when they become airborne
Answer: 10 microns

In general, organic soil readings are typically from _____ pH
Answer: 6.1 to 6.7

Categories of apparent soil are: pile distortion/fiber damage, pooling, shading and _____
Answer: Watermarking

Carpet will _____, acting like a filter within an indoor environment.
Answer: traps and holds soils



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SECTION 3 OVERVIEW

SAFETY

- Job Site Hazard Risk Assessment
- Equipment
- Electrical Precautions
- Electrical GFCI
- Chemical Considerations
- Chemical Storage
- PPE
- Miscellaneous Considerations



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SAFETY

- Safety is:**
- Everyone's responsibility
 - A critical element of professional commercial carpet cleaning services

- Safety requires:**
- Meeting minimum standards for federal, state, and local governments

- Safety recommendations include:**
- Client specific work conditions
 - Job site hazardous assessment is recommended (sometimes required by law)



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Hierarchy of Controls Risk Management



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EQUIPMENT SAFETY



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VEHICLE SAFETY

- SDS must be in a binder in alphabetical order where driver can reach it with seatbelt on (USA requirement)
- Check first aid kit, fire extinguisher, eye washing station on a regular basis
- Direct exhaust away from the facility if using any internal combustion engine to power equipment



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LIFTING/LOADING PROCEDURES

- Follow proper lifting and loading procedures
- Ensure all equipment and materials are loaded safely and securely to prevent shifting or moving cargo accidents



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SPECIAL EQUIPMENT

During a safety assessment:

- Determine which safety equipment, PPE, and procedures to use
- Consider facility and governmental requirements (e.g., OSHA), unions, and contractors
- Ensure the proper equipment to protect from all potential hazards
- Keep safety equipment readily available for any potential hazard (e.g., protective gloves, goggles, face shield, etc.)



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ELECTRICAL PRECAUTIONS



100

ELECTRICAL PRECAUTIONS

“The U.S. Consumer Product Safety Commission (CPSC) estimates that each year, about 4,000 injuries associated with electric extension cords are treated in hospital emergency rooms. About half the injuries involve fractures, lacerations, contusions, or sprains from people tripping over extension cords.”



US Consumer Product Safety Commission (CPSC) cpsc.gov

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ELECTRICAL PRECAUTIONS

Electrical considerations for a HAZCOM assessment:

- Know the fuses or circuit breaker locations
- Know lock-out devices or lockbox locations
- Never break off third prongs or use a plug that's missing the ground
- Use the correct gauge and recommended amount of cord to prevent overheating
- Take damaged or frayed cord out of service
- Do not touch a breaker box with wet hands
- Unplug all machines before servicing



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ELECTRICAL PRECAUTIONS

- Plug all electrically powered equipment directly into a grounded outlet via a GFCI
- Do not use multiple outlet strips or surge protectors





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ELECTRICAL PRECAUTIONS

Do:

- Check cords for damage before use
- Always use ground fault circuit interrupters (GFCIs)
- Ensure all equipment and extension cords have the mark of an independent testing laboratory
- Fully insert the plug of an extension cord into an outlet
- Keep extension cords away from water
- Unplug extension cords when not in use
- Whenever available use separate circuits when running equipment at the same time (dual circuit indicator)





104

ELECTRICAL PRECAUTIONS

Don't:

- Use an extension cord with a missing ground prong
- Plug multiple extension cords into one another
- Use an extension cord that has a lower wattage rating than the tool
- Force a plug into an outlet
- Use a damaged or wet extension cord
- Roll equipment over or step on a cord
- Drag equipment with an extension cord
- Place cords under rugs, carpets, or in heavily trafficked areas
- Run a cord through a doorway without a proper cord protector
- Use a power strip or surge protector in place of a GFCI

105

CHEMICAL CONSIDERATIONS



106

CHEMICAL SAFETY

- Always follow the label instructions
- Wear appropriate PPE
- Use a measuring cup
- Label secondary containers



107

PERSONAL PROTECTIVE EQUIPMENT (PPE)

- The employer shall provide personal protective equipment
- OSHA requires the employee understand the ability on how to use (Don and Doff) the equipment



108

CAUTIONS OF MIXING CHEMICALS

- Mixing sodium hypochlorite (household bleach) and ammonium hydroxide (ammonia) will make ammonium chloride, which can be fatal if breathed.
- Mixing reducers with oxidizers will release hydrogen sulfide gas (H_2S), which can be fatal if breathed



109

TOXICITY

Threshold Limit Values (TLV): airborne concentrations of chemical substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed, day after day, over a working lifetime, without adverse effects



Occupational Safety and Health Administration (OSHA), osha.gov

110

FLAMMABILITY

- Flashpoint: the point of classifying a chemical's flammability
- For commercial carpet, it is most commonly the vapor ignition point of a dry solvent
- Be aware of products' flashpoint



111

VENTILATION

When working in a confined space or with strong cleaning agents:

- Wear the appropriate PPE
- Increase ventilation



112

MISCELLANEOUS CONSIDERATIONS



113

SAFETY DATA SHEETS (SDS)

SDS are government forms associated with cleaning product information to help in case of emergency.

Topics include:

- Hazardous ingredients
- Physical/Chemical data
- Fire/Explosion data
- Health hazard data
- Reactivity data
- Spill, leaks, and disposal procedures
- Protection measures
- Special precautions



114

ADJACENT SURFACES

- Always be aware of slip and fall hazards
- Wipe, mop, or extract overspray or spills on the adjacent surface
- Protect adjacent floor surfaces from overspray (can cause damage)



115

SIGNS AND TAPE

- Post appropriate job safety and health protection signs on **every job**
- Place slip and fall warning signs on all areas where carpet meets hard surface



116

HAZARD COMMUNICATION STANDARD PICTOGRAM

	Explosive bomb See section 9.1 for handling instructions		Flame See section 9.1 for handling instructions		Flammable over 230°F See section 9.1 for handling instructions
	Gas cylinder See section 9.1 for handling instructions		Corrosion See section 9.1 for handling instructions		Skull and crossbones See section 9.1 for handling instructions
	Health hazard See section 9.1 for handling instructions		Exclamation mark See section 9.1 for handling instructions		Environment See section 9.1 for handling instructions



117

EVACUATION PLANS

All technicians should be aware of:

- Where fire alarms are located
- How to exit facility in case of emergency
- The emergency phone numbers (police, fire, property management)
- Appropriate staging points (muster point)



118

WATER DAMAGE RESTORATION

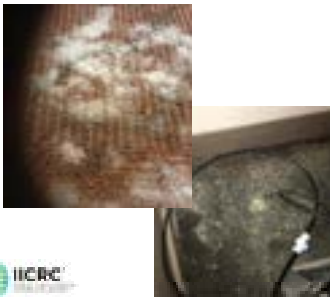
- **Don't** attempt restoration without training, equipment, or insurance
- **Do** have a basic understanding of the three categories of water damage
- **Do** abide by ANSI/IICRC S500 standard for water damage restoration
- **Do** take proper health and safety precautions for sewage loss (Category 3)



119

WATER DAMAGE RESTORATION

- **Don't** attempt restoration without training, equipment, and insurance
- **Do** report microbial growth to a supervisor immediately
- **Do** take safety precautions if you observe any microbial growth



Note: Consult the ANSI/IICRC S520 Standard for information about microbial growth remediation

120

REVIEW

- When cleaning a carpet adjacent to a hard surface you should _____.
ANSWER: post slip and fall warning signs
- When using cleaning and spotting solutions, you should have: the Safety Data Sheets, _____ and legible label instructions.
ANSWER: proper PPE
- Why are warning signs posted on a job site?
ANSWER: To identify hazards that may exist
- Corded cleaning equipment should be plugged directly into _____.
ANSWER: a grounded outlet
- When determining proper gloves, the _____ should be considered.
ANSWER: potential hazards
- Cleaning products should be used _____.
ANSWER: in a manner consistent with the product label
- What is the term for a chemical's flammability?
ANSWER: Flash point



121

REVIEW

What do the symbols below indicate?



1. **Chemical Irritants**



2. **Oxidizers**



3. **Acute toxicity**



4. **Flammables**



122

SECTION 4 OVERVIEW

Chemistry

- Understanding Chemistry and Physics
- Matter
- The pH scale
- Reactions
- Spotters, Dry extraction, Low moisture encapsulation and water rinse extraction
- Types of Cleaning Chemistries



123

AM0 Add answers

Ashley Mueller, 2022-05-09T19:16:46.784

UNDERSTANDING CHEMISTRY

- Essential to understand how chemicals react together
- Ensures a safe environment and that damage doesn't occur to the carpet



124

MATTER



125

MATTER

What is matter?

Anything which has weight and occupies space.

All things that we can: **See, Feel, Smell**


The States of Matter

- Gases
- Liquids
- Gels
- Solids




126

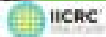
REACTIONS



$$2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$$

↑
New Substance






 IICRC®


127

MATTER

Changing the state of matter

Wax is a solid, but when heated, it becomes a liquid

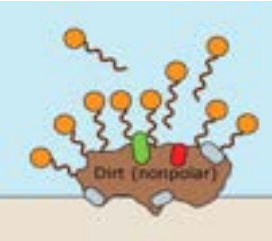
 IICRC®


128

MATTER

Separating Matter (Emulsification)

Detergents separate substances without changing the molecular structure.



 IICRC®

129

DISSOLVING MATTER

Solvents are chemicals that can dissolve another substance.
 Solvents dissolve the substance into its own state.



130

REACTIONS



131

REACTIONS

Two Types

Physical



Chemical



132

PHYSICAL REACTIONS

A change in a substance, doesn't change what the substance is



133

CHEMICAL REACTION

A chemical reaction is when a substance transforms into another substance. This is more likely to occur when dealing with a polar substance than a non-polar.



134

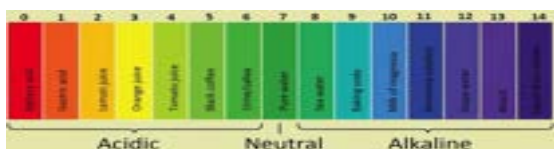
CHEMICAL REACTIONS: ACIDS AND ALKALINE

- Any polar (water-based solutions) must contain hydrogen, therefore it will have a pH
- Acids and their counterpart, Alkalines, make up most of the reaction we see in the carpet cleaning process.
- Most detergents are alkaline because most soils are acidic
- There are some acid-based detergents
- Most fiber protectors are acidic




135

REACTIONS



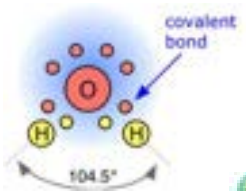


- Neutral is a **7** pH on the scale of **0-14**
- Each movement up or down from **7** (neutral) is a factor of 10.
- A movement from 7 to 6 is **10 times** more acidic
- A movement from 7 to 5 is **100 times** more acidic than neutral.
- A movement from 7 to 10 would be **1,000 times more alkaline** than neutral.



136

THE BASICS

- All elements will have equal electrons and protons in their natural state.
- All elements want to obtain 8 electrons in their outer orbit.
- All elements except the noble gasses have less than 8.
- All elements will try to share electrons from other elements.








137

INSOLUBLE SUBSTANCE

If a substance cannot dissolve in either a wet or a dry solvent, it is said to be an **insoluble substance**.


Most tracked-in soils are insoluble and, therefore, are not dissolved during cleaning.

138

POLARITY

<p>Hydrophilic</p> <ul style="list-style-type: none"> • Absorbs water, meaning it <u>likes</u> water • Nylon and wool 	<p>Hydrophobic</p> <ul style="list-style-type: none"> • Does not like water • Water-based solutions bead on its surface
<p>Lipophilic or Oleophilic</p> <ul style="list-style-type: none"> • Absorbs oil, meaning it <u>likes</u> oil • Olefin and polyester 	<p>Lipophobic or Oleophobic</p> <ul style="list-style-type: none"> • Does not like oil • Oil based solutions bead on its surface

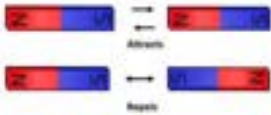



139

THE PHYSICS OF MATTER


Polarity of Matter

- Polar substances have plus (+) and minus (-) charges
- Non-polar substances have none





Polarities are the reason that oil and water do not mix



140

SOLVENTS


A Solvent is a substance capable of dissolving or dispersing one or more other substances.


Polar Solvents (Wet Solvents)

Water is the primary wet solvent and is often called the universal solvent.

Non-Polar Solvents (Dry Solvents)

Dry solvents are used as spotters.





141

SURFACTANTS

A surfactant is a surface-active agent that separate substances without changing the molecular structure.



Surfactants arrange themselves at every surface interaction (the hydrophobic tails want to get out of the water)



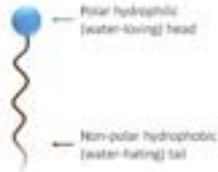
The action of separation
Surfactants insert their hydrophobic tail into the non-water material



142

POLARITIES OF SURFACTANTS

Surfactants have polarities, which determines what it will emulsify or suspend.



143

SURFACTANTS

Anionic (-)

- Negative charge (-) on its water-loving side
- Tail is water fearing
- Many are somewhat foamy
- Many dry to form pastes or powders that do not cause resoiling





144

SURFACTANTS

Cationic (+)

- Positive charge (+) on its water-loving side
- Tail is water fearing
- Example: Dimethylbenzyl ammonium chloride (called a quaternary ammonium chloride or just "Quats.")





145

SURFACTANTS

Nonionic (0)

- No charge
- Orientated toward oil





146

SURFACTANTS

Amphoteric (+/-)

- Will change based on pH
- Bay shampoo (no tears)
- Dawn dishwashing liquid (safe on animals)



147

SURFACTANTS

Reverse Saponification

- A sticky residue made by the mixing (coming in contact with) **anionic** and **cationic** surfactants.
- This is a chemical reaction between anionic and cationic surfactants.



148

BIOLOGICAL (BIOCHEMICAL) REACTIONS

Enzymes are chemicals that break down complex protein or other organic matter that is insoluble in normal detergent solutions.



149

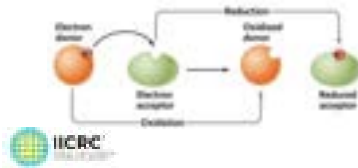
REDUCING OR OXIDIZING "REDOX"

Redox is a chemical reaction in which there is a transfer of electrons between reactants

The chemical compound that has the electron removed from it is said to have been oxidized, while the chemical compound that has an electron added has been reduced. This means that the process is always happening simultaneously, so in other words:

- Oxidizers **lose** electrons
- Reducers **gain** electrons

Cleaning Application: It is an exchange between oxidizing agents and reducing agents.



150

BLEACHING

- Chromophores:
 - Colored substances that generally contain groups of atoms
 - Can absorb visible light and have specific characteristic wavelengths
 - reflect or transmit the part of the light that is not absorbed
- Bleaching agents:
 - Destroy chromophores through oxidation or reduction of these absorbing groups
 - Can be an oxidizing or reducing agent



151

OXIDIZERS

- Work by chemically changing the staining agent to a colorless compound.
- Oxidizing agents also known as bleaches.
- Oxidizers can eventually remove the color from base material
 - Household bleaches (Sodium Hypochlorite)
 - Hydrogen peroxide
 - Sodium percarbonate



152

REDUCERS

- Reducing bleach (like sodium bisulfite, sodium metabisulfite, sodium dithionite, and sodium borohydride) works by converting double bonds in the chromophore into single bonds.
- This eliminates the ability of the chromophore to absorb visible light.
- Reducing agents can be accelerated by heat or acids.



153

DEODORIZERS

Bio-Enzymatic Deodorizer

- Dissolves the bacteria's food source, so the odor does not return
- Often takes time to remove the odor source completely

Odor-Eliminating Deodorizers

- Bind to odor molecule changing its structure so it can't attach to the odor receptors in our nose
- Effective against smoke and sulfur-based smells

Oxidizing Deodorizers (e.g., peroxides and chlorine dioxides)

- Breaks down the outer cell walls by oxidation
- Often referred to "anti-allergen" deodorizers

Masking Agent Deodorizers

- Long-lasting fragrance remains after a surface has been cleaned
- Usually, an oily solution to not evaporate too fast
- Can add to the rapid re-soil of the carpet



154

SPOTTERS, DRY EXTRACTION, LOW MOISTURE ENCAPSULATION AND WATER RINSE EXTRACTION



155

POLAR SPOTTERS

Neutral Detergent Spotter (NDS)

- Use on general soiled spots
- Requires clean water rinse

Acid Spotter (AS)

- Use on coffee or tea
- Requires clean water rinse

Charged Particles (CP)

- Use on filtration soil along walls, under doors, around vents, toner spills, any charged particles soil
- Requires clean water rinse



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POLAR SPOTTERS CONTINUED

Rust Remover (Oxalic Acid)

- Use on rust only
- Burns skin; rinse skin immediately
- Corrodes metal, etches glass; possible dye change
- Requires neutralizer rinse and clean water rinse

Protein Digester (Enzyme)

- Use on blood, egg, milk, vomit, protein
- Do not use a protein digester on wool carpet
- Requires clean water rinse



157

NON-POLAR SPOTTERS

Volatile Dry Solvent (VDS)

- Oil, grease, tar, asphalt, paint, rinse for NVDS residue, adhesives
- May set inks and permanent marker spots, dissolves latex and delaminates carpet
- Volatile means that the solvent evaporates rapidly and completely

Non-Volatile Dry Solvent (NVDS)

- Requires either a VDS or clean water rinse
- Does not evaporate completely
- Can cause same issues as VDS if used improperly



158

DRY COMPOUND

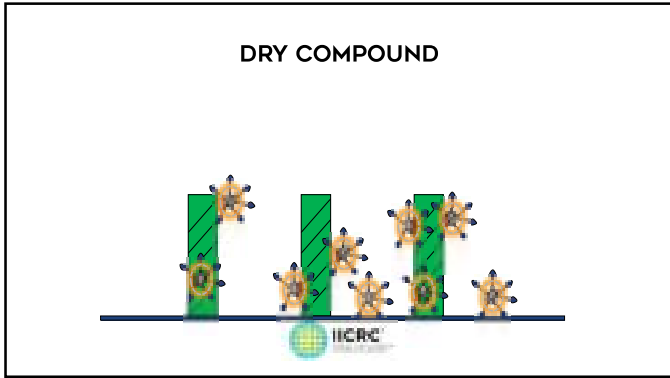
Absorbent or Adsorbent materials that can be the **delivery system** for the chemistry along with the **extraction material** for the micelles.

Types:

- **Solid Material:** Natural or man-made, absorbent or adsorbent
- **Liquid Detergent:** Can be pre-applied to the carpet or can pre-loaded in the solid material



159



160

LOW MOISTURE ENCAPSULANTS

Surfactants




- Separate soils from fiber creating micelles

Encapsulation Polymer

- Essential to a liquid low moisture cleaning chemical
- Encapsulate the micelles created by the surfactants

Chelating Agent

- Combines itself with these disruptive metal ions in the water
- The metal ions are surrounded by the claw-like chelating agent which alters the electronic charge of the metal ions from positive to negative

161

LOW MOISTURE ENCAPSULANTS

Encapsulants


- Polymers create micelles then encases and crystallizes

Encapsulants Cleaner

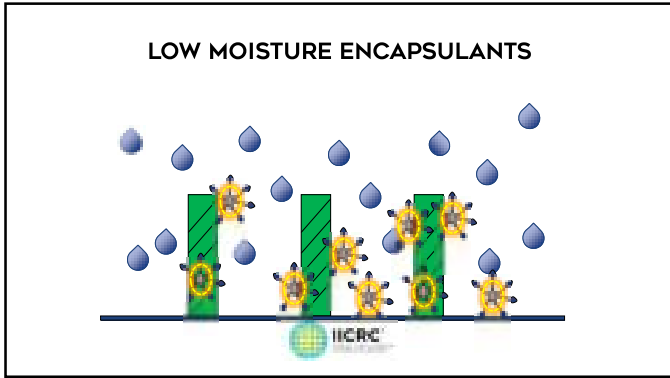
- Polymers along with surfactants
- Releases soils from fibers
- Creates micelles then encases and crystallizes.

Encapsulants Cleaner Re-Fortifier

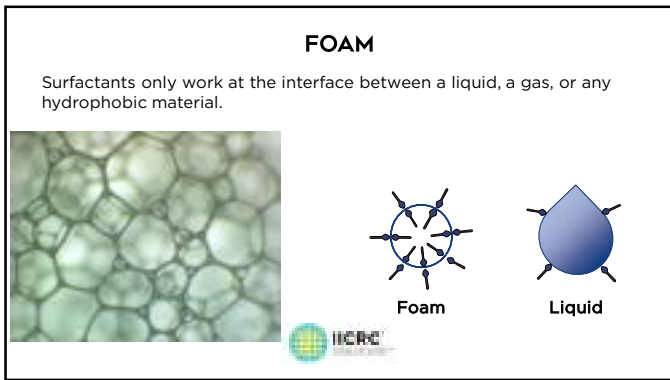
- Polymers along with acid dye blockers
- Create micelles, then encases and crystallizes
- Also refortifies the acid dye sites



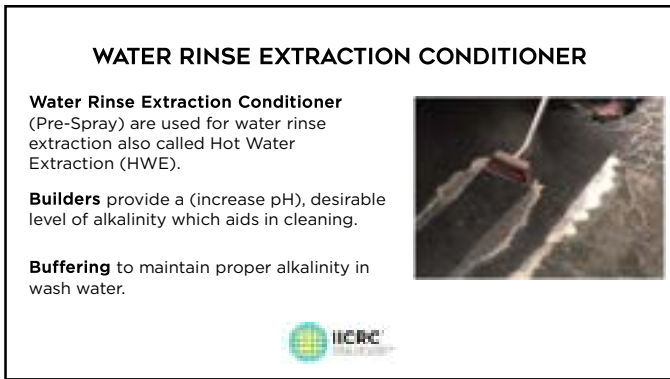
162



163



164



165

WATER RINSE EXTRACTION CONDITIONER

Emulsifiers used on oily and greasy soil by breaking it up into tiny globules

Surfactants separate the soils from the fiber creating the micelles

Chelating Agent combines itself with these disruptive metal ions in the water. The metal ions are surrounded by the claw-like chelating agent which alters the electronic charge of the metal ions from positive to negative



166

STAIN AND SOIL CHEMISTRIES

Chemistries applied to carpet fibers during the manufacturing process as well as can be applied after installation.

- They reduce surface tension.
- They interrupt dyes from adhering or absorbing into the carpet fiber.
- The carpet manufacturers are now using new hydrocarbon-based formula fiber treatments that do not contain any PFOA.



167

REVIEW

1. Enzyme preconditioners will break down _____?
Answer: fatty soils, vegetable oils, and food spills
2. Chemical activity of a cleaning solution will _____ as temperature rises?
Answer: increase
3. The only appropriate cleaning agent to use on wool fibers should be?
Answer: Tested and an approved product
4. What is the term for describing a chemical that evaporates quickly?
Answer: Volatile
5. What does an oxidizing agent do?
Answer: Chemically changes the staining agent to a colorless compound
6. What will heat do while using a reducing agent?
Answer: Accelerate the process



168

REVIEW

1. Insoluble substances _____ broken down with either water-based or dry solvent-based cleaners?
ANSWER: can not be
2. What can change a fiber color if dyed with indicator dyes?
ANSWER: Change in pH
3. A pH of 7 on the scale is?
ANSWER: Neutral
4. Most carpet-cleaning chemistries are on the ____ side of the pH scale?
ANSWER: Alkaline
5. A _____ will dissolve other substances?
ANSWER: Solvent
6. A 9.0 on the pH scale is?
ANSWER: An alkaline



169

REVIEW

1. Is a 3 a great change in pH than a 9?
ANSWER: Yes
2. What can an oxidizing bleach do?
ANSWER: Cause permanent color loss in nylon carpet
3. What will a urine stain do when a black light on it?
ANSWER: Fluoresce yellow-green
4. A 4.5 pH on the pH scale is?
ANSWER: An acid



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SECTION 5 OVERVIEW

Disinfection and Sanitization

- Definitions and differences
- How to use
- Safety
- Equipment
- Antimicrobials/Biocides



171

INDUSTRY DEFINITIONS AND TYPES

Germicide

A substance or other agent that destroys harmful microorganisms.

Microorganism (Microbe)

An extremely small organism that usually is visible only with the aid of a microscope (e.g., protozoa, algae, bacteria, fungi, virus).

Sanitizer

Reduces the number of but does not destroy all microorganisms on inanimate objects. Effectively destroys 99.9% of target organisms.



172

INDUSTRY DEFINITIONS AND TYPES

Sanitization

The process of cleaning and properly using a governmentally approved and registered disinfectant (such as a US EPA registered disinfectant) that is approved for sanitizing porous surfaces and would honor the parameters set by the carpet manufacturer as safe for use on their carpet. The instructions for applying the disinfectant chemistry must be followed, as prescribed on the approved label, to achieve any sanitizing level.



173

INDUSTRY DEFINITIONS AND TYPES

Sterilization

Validated process used to render a product free of all forms of microorganisms. In a sterilization process, the presence of microorganisms on any individual item can be expressed in terms of probability. Although this probability can be reduced to a very low number, it can never be reduced to zero.



174

INDUSTRY DEFINITIONS AND TYPES

Sterilize

Use of a physical or chemical procedure to destroy all microbial life, including highly resistant bacterial endospores.

Sterilizers (Sporicides)

Products used to destroy or eliminate all forms of microbial life, including fungi, viruses, and all forms of bacteria and spores.



175

TYPES OF DISINFECTANTS

Some of the more common disinfecting chemistries are:

- Quaternary ammonium (i.e., Quat)
- Phenolics (e.g., Lysol)
- Botanical (e.g., tea tree oils, thyme oil)
- Hydrogen peroxide
- Sodium hypochlorite (i.e., Bleach)
- Chlorine dioxide



176

HOW TO USE

- Follow the label instructions
- Only use on a clean surface
- Meet the appropriate dwell time
- Use a Colorfastness and pH compatibility test on any soft surface textile
- Check with your local government about applicable licenses



177

SAFETY

- Use the appropriate respiratory equipment
- Some products require additional eye and skin protection
- Address exposure to other occupants and contents
- Some companies may choose not to participate due to exposure of liability
- Some companies may choose to use special language or contracts for this type of work
- Dispose of unused or expired products according to the label or SDS instructions



178

EQUIPMENT

Apply antimicrobials with:

- Pressure Sprayers
 - Trigger
 - Pump (compression)
 - Electric
 - Battery-powered
- ULV or Wet Foggers
- Electrostatic Sprayers



179

REVIEW

1. To reduce the number of harmful microorganisms you can _____.

ANSWER: Apply a sanitizer to commercial carpets

2. Carpet (a soft porous surface) and can only be _____.

ANSWER: Sanitized



180

SECTION 6 OVERVIEW

Cleaning Practices and Characteristics

- The Five Principles of Carpet Cleaning
- Spots vs. Stains vs. Color Loss
- Types and Treatments
- Equipment and Tools
- Cleaning Methods
- Extraction Systems



181

CLEANING

The process of removing unwanted substances from an environment or material.

- ANSI/IICRC S100



182

BUT BEFORE WE DO THE OFFICIAL WORK...

Pile Lifting/Nap Preparation

- Dry Process
- Opens compacted fibers
- Allows the airflow of the vacuum to remove the soil more effectively
- Use a cylindrical brush machine or carpet pile lifter with appropriate brushes



183

THE FIVE PRINCIPLES OF CARPET CLEANING



184

1ST PRINCIPLE: DRY VACUUMING

- Remove as much of the particulate soil as possible
- Change vacuum bags (no more than 2/3 full)
- Use vacuum cleaner with a HEPA filtration system
- Vacuum high-traffic areas daily with a CRI seal of approval certified vacuum



185

2ND PRINCIPLE: SOIL SUSPENSION

Intends to separate bonded soils, which are not removed with dry soil removal procedures, from fibers

Maximum soil suspension incorporates four fundamentals:

1. Time
2. Agitation
3. Chemistry
4. Temperature



186

SOIL SUSPENSION: THE SINNER CIRCLE PRINCIPLE

When one (or more) of the soil suspension fundamentals decrease, one (or more) of the others must be increased for optimum soil separation



- chemical activity (orange)
- temperature or heat (grey)
- agitation (blue)
- time (yellow)



187

SOIL SUSPENSION: TIME

Dwell Time

- The longer any cleaning chemical stays in contact with the soil, the more effective the soil removal
- Increase dwell time = increase effectiveness
- The preconditioner must not dry out before the extraction for this principle to be effective



188

SOIL SUSPENSION: AGITATION

- Required, in some form, to accomplish uniform solution penetration and distribution
- Can be done by equipment like a counter rotational brush (CRB)
- Soil suspension tends to be non-uniform without agitation



189

SOIL SUSPENSION: CHEMISTRY

- Loosens and emulsifies the sugars, fats, oils, and chemical residues that act as binding agents
- Preconditions (detergents) work at a specific dilution ratio



190

SOIL SUSPENSION: TEMPERATURE

Higher temperatures accelerate water molecule movement, thereby causing cleaning agents to function more effectively.



191

3RD PRINCIPLE: EXTRACTION OF SUSPENDED SOIL

- Physically remove suspended soil after achieving optimum soil release
- The processes for removing soils:
 - Water rinse extraction
 - Dry vacuuming: dry absorbent compound
 - Dry vacuuming encapsulation



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3RD PRINCIPLE: EXTRACTION (DRY ADSORBENT COMPOUND)

- Dry compound method removes suspended soil by vacuuming
- Absorbent compound method
 - Can add many points to Leadership in Energy and Environmental Design (LEED) certification
 - Allows the carpet to be walked on immediately after cleaning



193

3RD PRINCIPLE: EXTRACTION (ENCAPSULATION EXTRACTION)

Once the soil is suspended, encapsulation occurs and you can vacuum to remove it.

Encapsulation:
the crystallized chemistry trapped the soil once dried



194

3RD PRINCIPLE: EXTRACTION (WATER RINSE EXTRACTION)

Once the soil is suspended, the suspended soil evacuates via the water rinse extraction process.



195

4TH PRINCIPLE: GROOMING

- Does not contribute to soil removal
- Essential for long-term performance
- Enhances the appearance of the carpet
- Helps with the drying process



196

5TH PRINCIPLE: DRYING

Re-soiling will occur in the carpet if it is not completely dry.

Affects drying time:

- Residual moisture from the cleaning process (air movement)
- HVAC operation
- Temperature and humidity
- Application of post-cleaning treatments
- Fiber type and absorbency
- Carpet construction and style
- Pile height, weight, and density
- Soil levels



197

CLEANING METHODS



198

VACUUMING OR NAP PREPARATION (PILE LIFTING)

Purpose:

- Spot removal
- Entry mat cleaning

Please Note: Carpeted areas adjoining hard surface areas are vulnerable to excessive soiling and need to be vacuumed more frequently

"Removing 1 pound of dirt from inside a building costs approximately \$700."
- ISSA



199

DRY ABSORBENT COMPOUND (LOW MOISTURE CLEANING)

A maintenance system OR an extraction system

Steps:

1. Pre-vacuum
2. Pre-spotter (only if needed)
3. Pre-conditioner (only if needed)
4. Broadcast dry compound
5. Agitate
6. Allow to dry
7. Vacuum completely



200

ENCAPSULATION (LOW MOISTURE CLEANING)

Use encapsulation technology as a maintenance product for the best results

Steps:

1. Pre-vacuum
2. Pre-spotter (only if needed)
3. Apply pre-conditioner
4. Agitate
5. Allow to dry
6. Vacuum completely



201

WATER RINSE EXTRACTION

Steps:

- 1. Pre-Vacuum
- 2. Pre-Spot
- 3. Pre-Apply (if needed)
- 4. Mix Solution
- 5. Apply Cleaning Solution
- 6. Agitate
- 7. Dwell
- 8. Acid Rinse in Tank
- 9. Extract
- 10. Groom
- 11. Dry Carpet



202

ISSUE WITH CLEANING: POSSIBLE WICKING

Wicking: "A term used to describe the upward migration of water-soluble materials on carpet fiber surfaces during drying. Wicking is a cause for recurring spots and stains."
 S100 -12.8.3 Soil Wicking



Wicking can be so excessive that the carpet looks dirtier after cleaning.



203

SPOTS VS. STAINS. VS. COLOR LOSS



204

205

SPOT CLEANING



205

SPOTS


Spots are adsorbed to the fiber and can be removed using the appropriate cleaning agent in the standard cleaning process.



206

STAINS

Stains are absorbed into the fiber and may look like spot, but a stain has added color to the fiber.



207

Slide 205


AAO Video

Allie Allen, 2022-05-06T17:31:52.514

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Ashley Mueller, 2022-05-09T19:38:13.779

TYPES AND TREATMENTS





208

WATER-BASED

- The most common spots
- Usually, removed in the normal cleaning process

Recommended Cleaning:
Use a neutral detergent spotter to help suspend the spot


209

PETROLEUM-BASED

Tar, asphalt, greases, oils, paints, and most adhesives

Recommended Cleaning:

- Use volatile and non-volatile dry solvents to help suspend the spot
 - Use citrus solvents to remove chewing gum, tar, oil, or other oily and greasy stains
 - Use non-volatile dry solvent (NVDS) or paint, oil, and grease remover (POG) to remove paint or adhesives



210

Slide 209

AM0 Add examples and a picture

Ashley Mueller, 2022-05-04T21:47:50.315

PROTEIN-BASED (BIOLOGICAL AND ORGANIC)

Blood, urine, vomit, and some food products

Recommended Cleaning:

- Use a bacterial enzyme to digest protein and help suspend the spot.
- Follow the manufacturer's directions for the appropriate operating temperature and dwell time to be effective.
- Use PPE and safety precautions when working with biologicals

Please Note: Do not use bacterial enzymes on protein-based natural fibers (e.g., wool, etc.)



211

TANNIN STAINS

Removal Agents

- Mild reducing agent to destroy the stain without rinsing
- Oxidizer (hydrogen-peroxide)
- Mild acid solution (cellulosic browning)



212

DISPERSE DYE

Removal Process:

1. Mist a charged particle chemistry on area
2. Apply a reducing agent
3. Apply heat transfer system
4. Repeat as needed

Please Note: color loss can occur when working on yarn dyed carpet

These are the toughest of all stains to remove and most times only come out 85%.

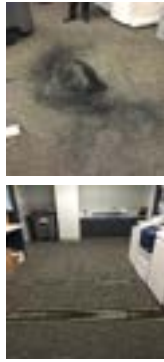


213

DRY TONER

Removal Process:

1. Vacuum excess dry material (vacuum only, no beater bar action)
2. Mist a charged particle chemistry on area
3. Apply ink spotter to a clean white cloth
4. Working from outside into center
5. Repeat, as needed
6. Thoroughly rinse area with VDS or water rinse extraction



214

INK STAINS

Removal Process:

1. Apply specifically designed ink spotter (designed to not evaporate the resins) on a clean white cloth
2. Repeat action as needed
3. Rinse area with VDS or water rinse extraction

Please Note: Do not overapply the solvent on any synthetic backed carpet- **can cause delamination.**



215

SYNTHETIC DYE STAINS

Removal Process:

1. Apply a strong reducer or heat transfer solution
2. Place a white cotton towel over the stain
3. Fill an iron with water and set it to the lowest steam setting
4. Place the iron over the white terry-towel for 30 seconds maximum
5. Remove iron and allow the carpet to cool for a few minutes before re-applying the heat
6. The dye will either transfer into the towel or disappear



216

RUST STAIN

- Rust stains are iron oxide
- Rendered colorless, typically with strong acid

Removal Process:

1. Put on proper safety equipment, such as glove and safety goggles
2. Apply rust removing agent to the area
3. Allow for dwell time on the label instructions, may need slight agitation
4. Neutralize the stain with an alkaline until achieving a pH 7
5. Rinsed thoroughly



217

CANDLE WAX

Removal Process:

1. Cover it with absorbent material
2. Place an iron, in steam mode, over the absorbent material.
3. Rotate absorbent material
4. Repeat until the wax is removed

How it works:

The iron's heat melts the wax, allowing it to wick into the absorbent material.



218

INSOLUBLE STAINS

- Vacuum out only
- Encapsulants may be the only effective chemistry
- All other chemicals, both wet and dry, make insoluble stains more difficult to remove



219

DISCOLORATION

- If a stain is lighter than the surrounding carpet, then there is a color loss.
- Common causes of discoloration on wool and nylon fibers:
 - Pesticides
 - Pet urine
 - Chlorine bleach
 - Floor strippers
 - Glass cleaners
 - Toilet bowl cleaners



220

STEPS FOR STAIN REMOVAL

Evaluate the type of fiber to start the process.

1. Remove Solids
2. Apply Oxidizer or Reducing Agent
3. Cover it with a damp towel
4. Apply heat using a steam iron
5. Evaluate
6. Rinse



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STEPS FOR STAIN REMOVAL

VIDEO



222

Slide 222

AAO video


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Ashley Mueller, 2022-05-09T19:44:06.390


AD

STEPS FOR INTERIM MAINTENANCE CLEANING
VIDEO



223

STEPS FOR WATER RINSE EXTRACTION
VIDEO



224

EQUIPMENT AND TOOLS



225

Slide 223

AAO video

Allie Allen, 2022-05-06T17:32:57.720

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Ashley Mueller, 2022-05-09T19:44:14.511

UNDERSTANDING EQUIPMENT

The proper equipment is vital to getting the results that you expect.



Water Rinse Extraction removes the most soil of all the cleaning processes.



226

EQUIPMENT TERMINOLOGY: CUBIC FEET PER MINUTE (CFM)

- The volume of air molecules that can flow through a 2" diameter opening in one minute is the testing method used to measure CFM for vacuum motors.
- Responsible for how fast air molecules can be evacuated out of a given volume of space.



227

EQUIPMENT TERMINOLOGY: LIFT

- A measurement of the amount of air molecules that can be evacuated from a sealed container.
- The higher the lift number, the less air molecules remain in the space, thus creating more vacuum.



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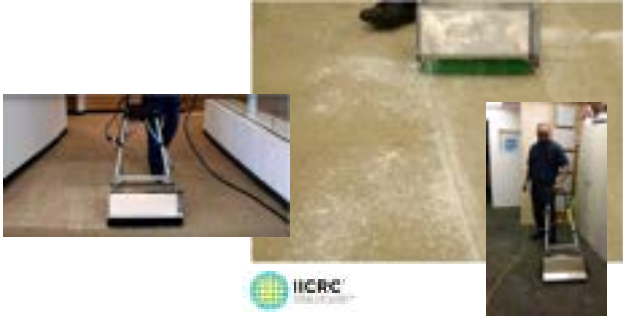
EQUIPMENT TERMINOLOGY

- **Air Watts:** measure the efficiency anywhere in the power curve of a motor $(CFM * Lift) / 8.5 = \text{Air Watts}$
- **Pounds per Square Inch (PSI):** the measurement of water pressure at any given flow rate. Standard Rate: between 250-500 psi.
- **Gallons per Minute (GPM):** the measurement of the volume of water used through different sized jets in the extraction wands at different PSI settings.
- **Heat:** the temperature of water. Hot is not always better than cold.



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UNDERSTANDING EQUIPMENT



230

UNDERSTANDING EQUIPMENT, TOOLS



231

EQUIPMENT THAT IS **NOT RECOMMENDED BY MOST ALL CARPET MANUFACTURERS**




232


EQUIPMENT THAT IS **NOT RECOMMENDED BY MOST ALL CARPET MANUFACTURERS**




233

REVIEW

1. How do detergents work?
ANSWER: They suspend and emulsifying soils
2. To distribute preconditioners efficiently use a _____?
ANSWER: manual or mechanical brush
3. Incomplete soil or spill removal can cause _____?
ANSWER: soil wicking
4. The primary benefit of using a vacuum with a high-efficiency filtering system is _____?
ANSWER: Improving the indoor air quality
5. _____ can help in the removal of gum.
ANSWER: Citrus gel solvent
6. Watermarking and pooling _____ be corrected by cleaning.
ANSWER: cannot
7. The first step in removing copier toner is _____?
ANSWER: Pre-vacuum with suction only



234

REVIEW

- 1. Rust stains can be removed with a _____.
ANSWER: formulated acid spotter
- 2. A protein spotter can remove spots like _____, egg, and milk?
ANSWER: blood
- 3. You should _____ with a spotting brush to work a spotting agent into carpet fibers.
ANSWER: tamp
- 4. Absorbent compound extraction method is suitable when carpet?
ANSWER: Must be walked on immediately after cleaning
- 5. A dry solvent _____.
ANSWER: can cause delamination on tufted carpet.
- 6. A formulated mild acid spotting solution can typically remove?
ANSWER: Cellulosic browning
- 7. _____ will be present for cellulosic browning to occur?
ANSWER: Plant fibers



235

REVIEW

- 1. The time required for a preconditioner to suspend soils is _____.
ANSWER: Dwell time
- 2. An accurate pre-inspection can _____?
ANSWER: minimize concerns for the client
- 3. Technician error is often the cause of _____.
ANSWER: over wetting issues
- 4. Chemical action, temperature, agitation, and time are _____?
ANSWER: the four fundamentals of soil suspension
- 5. To prevent and minimize unraveling and tuft loss _____.
ANSWER: carpet sprout or snags be trimmed
- 6. Paint and grease can be removed by using _____.
ANSWER: non-volatile dry solvent
- 7. A tannin spotter can remove?
ANSWER: Cellulosic browning



236

REVIEW

- 1. During the prework walkthrough a technician should _____.
ANSWER: Evaluate the cleaning system needed
- 2. Insufficiently diluted cleaning agents can cause?
ANSWER: Rapid resoiling
- 3. A preconditioning agent _____.
ANSWER: suspends soils and increases cleaning efficiency
- 4. Using a _____ reduces suds in hoses and recovery tanks.
ANSWER: defoamer
- 5. The simplest way to keep carpet clean is _____.
ANSWER: vacuuming
- 6. _____ in woven carpet can cause shrinkage when wet cleaning.
ANSWER: Natural fibers



237

REVIEW

- 1. A _____ is the best to remove soft drink spills on carpet.
Answer: detergent solution followed by thorough rinsing
- 2. After using a rust remover, you should always _____.
Answer: rinse, and in some cases, neutralize
- 3. A vacuum bag should be changed before it is?
Answer: 2/3 full
- 4. To reduce drying time after water rinse extraction, you can use _____.
Answer: air moving equipment
- 5. Carpet fibers will turn yellow if _____ are allowed to remain in the carpet too long without being removed and oxidized.
Answer: oily soils
- 6. Soil wicking may be prevented by?
Answer: Dry vacuuming prior to water rinse extraction



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SECTION 7 OVERVIEW

The Importance of Planned Carpet Maintenance

- The Carpet Maintenance Program
- Benefits of a Maintenance Program
- The Effects of Neglect
- Identifying Specific Maintenance Needs
- Types of Maintenance Plans
- Understanding USGBC LEED Program



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THE IMPORTANCE OF PLANNED CARPET MAINTENANCE

A persistent and thorough carpet maintenance program:

- Will remove or minimize soil
- Keeps the carpet looking better longer
- Enables the carpet fiber to perform as intended
- Protects and preserves the investment of the carpet
- Contributes to good indoor air quality



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THE CARPET MAINTENANCE PROGRAM

“Commercial carpet installations should **have a plan for programmed soil removal and management**. The maintenance aspect of soil management should be planned with many factors considered (e.g., budget, occupants, types of floor covering, sources and types of soil, concentrations of soil, and the appearance level desired by the facility manager).”

- ANSI/IICRC S100 6.4.1 Commercial Carpet Maintenance Programs



241

THE CARPET MAINTENANCE PROGRAM

Appropriate cleaning frequency rates:

- Vacuuming
- Spot cleaning
- Pile lifting
- Interim cleaning
- Deep cleaning



Color-coded diagram of a building's floor space furniture layout.

242

CARPET WARRANTY

- Carpet comes with a warranty at the time of purchase
- Follow the carpet manufacturer's recommended maintenance guidelines to achieve longest life
- Warranty may be void if guidelines aren't followed



243

ADDITIONAL BENEFITS OF A CARPET MAINTENANCE PROGRAM



Improves indoor air quality



Improves productivity



Improves sense of well being



244

CLEANING HAS A VERY REAL AND MEASURABLE VALUE

2-8% PRODUCTIVITY GAIN = **\$125,000 IN SAVINGS**

CUSTOMERS PREFER CLEAN BUI

94% **CLEAN FACILITIES ARE NOT JUST A COST. THEY GENERATE REVENUE.**



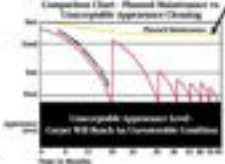

245

THE EFFECTS OF NEGLECT

Maintaining and cleaning of carpet should be viewed holistically in relation to total building system maintenance. Neglect one system, and, in time, others suffer. Various broader maintenance activities, or lack thereof, affect each other:


The ideal maintenance program:

- Helps prevent soil from attaching to the carpet
- Removes soil before it causes damage
- Adapts to a facility's specific needs

246

TYPES OF MAINTENANCE PLANS



247

**THE CARPET MAINTENANCE PROGRAM:
FOUR CLASSIFICATIONS OF CARPET MAINTENANCE**



248

IDENTIFYING SPECIFIC MAINTENANCE NEEDS

Things to look for during a site survey:

- Heavy concentrated traffic areas
 - Break areas/kitchen areas
 - Restroom
 - Entrances
- Spills and stains
- Specialized equipment areas



This is the time to evaluate the cleaning system needed



249

PREVENTATIVE MAINTENANCE

- Keeps soil outside
- Start cleaning before entering the building (e.g., cleaning the parking lot)
- Captures soil and moisture at the door



250

PREVENTATIVE: WALK OFF MAT SYSTEM

- Best defense for dirt and grit control
- Captures soil and moisture at the door
- Additional mats may be required during periods of inclement weather



251

PREVENTATIVE: THREE-STEP MATTING SYSTEM

- 1. Scraper Mat**
Utilizes natural or synthetic matting to scrape away larger amounts of dirt and grit attached to shoes
- 2. Scrubber Mat**
Traps soil and moisture before it can come in the facility
- 3. Wipe Mat**
Absorbs moisture and removes remaining soil meeting the floor



252

PREVENTATIVE: MAT LENGTH CONSIDERATIONS

Matting should have at least four-foot falls before stepping on to a floor.



Source: American Institute of Architects

253

DAILY MAINTENANCE

Why?

Remove as much soil as possible and as frequently as allowable



"Removing 1 pound of dirt from inside a building costs approximately \$700."
- ISSA

- Daily Maintenance Procedures:
- Vacuuming or nap preparation (pile lifting)
 - Spot removal
 - Entry mat cleaning



254

INTERIM CLEANING

Why?

- Prolongs the need for restorative cleaning
- Remove surface soils
- Higher production rate than restorative cleaning
- Quicker drying carpet



255

DEEP CLEANING

When soil content or visual appearance reaches levels that warrant deep cleaning process, it requires some deep cleaning method be used.



256

Commercial Deep Cleaning Frequency Chart

Area/Type	Frequency	Method	Frequency	Method	Frequency
Light Traffic	Weekly	Hot Water Wash	1-2x annually	Hot Water Wash	1-2x annually
Medium Traffic	Weekly	Hot Water Wash	2-4x annually	Hot Water Wash	2-4x annually
Heavy Traffic	Weekly	Hot Water Wash	4-8x annually	Hot Water Wash	4-8x annually
Very Heavy Traffic	Weekly	Hot Water Wash	8-16x annually	Hot Water Wash	8-16x annually



Source: ANSI/IICRC S100

257

REVIEW

1. During periods of inclement weather additional _____ may be needed.
ANSWER: entry matting

2. Interim maintenance cleaning _____ and faster drying .
ANSWER: has a high production rate

3. When one area in a building is neglected, it affects the _____.
ANSWER: performance in all building areas and systems

4. Carpet should be vacuumed more frequently adjacent to _____ because it soils more rapidly.
ANSWER: hard surfaces

5. Daily maintenance should include; vacuuming, spot removal, and _____.
ANSWER: entry mat cleaning



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REVIEW

1. _____ areas require more frequent vacuuming.

ANSWER: Entry

2. Using a vacuum with _____ & _____ is recommended for commercial carpet maintenance.

ANSWER: high-velocity airflow and pile agitation

3. Pile lifting devices _____ from matted carpet pile.

ANSWER: dislodge embedded soils

4. _____ maintenance is part of planned maintenance including the use of walk-off mats.

ANSWER: Preventative

5. The primary benefits of planned carpet maintenance is to _____ while creating a cleaner, healthier indoor environment.

ANSWER: extend carpet life



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SECTION 8 OVERVIEW

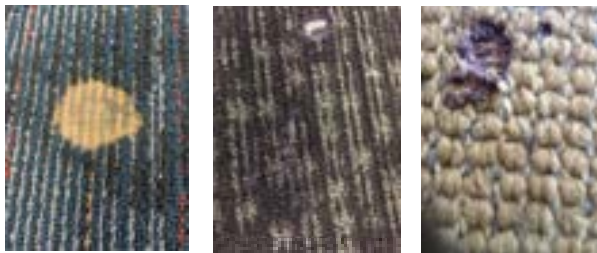
Common Problems and Troubleshooting

- Battery Acid
- Dispersed Dyes
- Toner Spill
- Manufacturing Defects
- Ice Melt
- Charged Particle
- Pesticides
- Topical Exposure
- Color Shift
- Polymer Build-up
- Pooling or Watermarking
- Reappearing Spots
- Sub-floor issues



260

BATTERY ACID

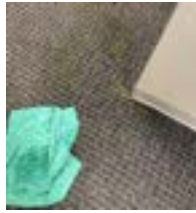


261

DISPERSED DYES



Furniture stain



Tandoor chicken stain



262

TONER SPILL

Toner is dried ink that has an electrical charge added to it. It is easy to remove with the proper steps.



263

URINE STAINS



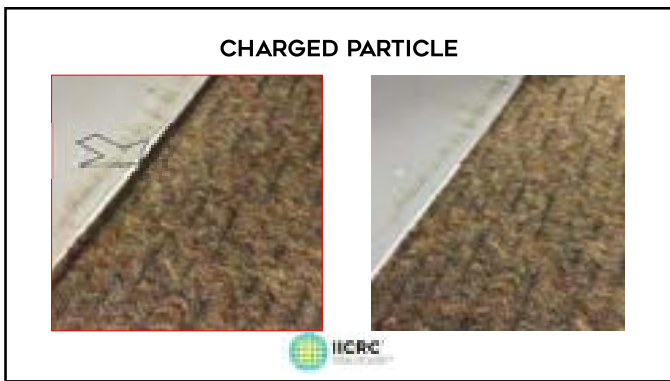
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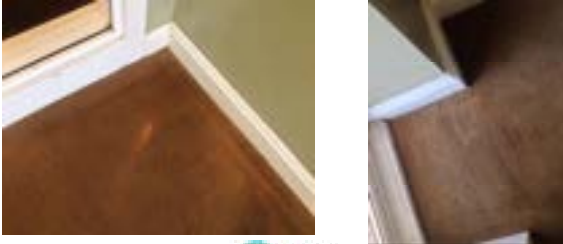


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PESTICIDES



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TOPICAL EXPOSURE

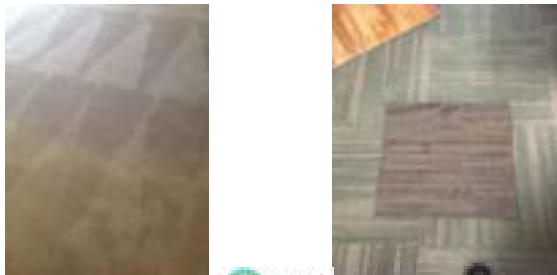


Photo 1



Photo 2

269

COLOR SHIFT



270



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272



273

REAPPEARING SPOTS



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SUBFLOOR ISSUES



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ACKNOWLEDGMENTS

This presentation is the result of a collaborative effort involving industry experts on the IICRC Commercial Carpet Maintenance Technician (CCMT) *Exam Revision Group (ERG)*. Their generous contribution of their time and knowledge made this comprehensive course possible.



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AFTER THE CERTIFICATION COURSE- EXAM



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