

NANOTUBE ESD SYSTEM TDS



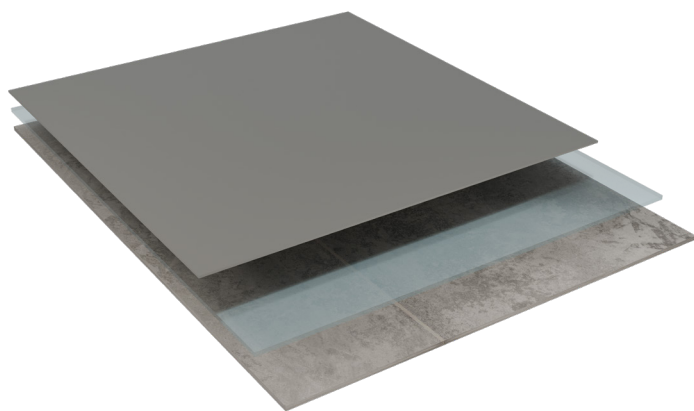
THOUGHTFULLY DESIGNED COATINGS

ESDN MVR-TS, 30 mils

MVR Coat · Nanotube ESD Technology · Conductive or Dissipative

Meets USDA, FDA, EPA, and SCAQMD VOC requirements.

KRETUS® ESDN MVR-TS provides all of the benefits of a traditional ESD system, and more, in a single application! Kretus Nanotube ESD incorporates carbon nanotube technology to enhance wear resistance and strengthen ESD control. Available in cost-effective epoxy or high-performance poly.



3. **Top coat:** Epoxy or Poly Select ESD Kit
4. **MVR coat:** Kretus OMG Blocker Kit
5. **Substrate:** properly prepared concrete (ICRI CSP 3), metal, wood, or non-glazed tile

WHY CHOOSE ESDN MVR-TS?

- ✓ Stronger ESD resistance: $>10^4$ to $<10^6$ ohms.
- ✓ Sold as a boxed kit for maximum control.
- ✓ Carbon nanotube technology for easier installation than traditional ESD.

POPULAR COLORS



STONE



SLATE



GREIGE



BAJA



OCEAN



MAROON

*colors shown are for Polyurethane HP top coat

IDEAL FOR SPACES INCLUDING...

- data centers
- aircraft hangars
- electronics assembly & production
- cleanrooms
- hospitals
- sensitive product storage
- hazardous industries
- heavy-traffic warehouses
- server rooms

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This is a quick-reference technical summary. Review all required documents before you start.

NOTES

Concrete moisture tolerance: MVER (ASTM F1869) = up to 25 lbs / 1,000 SF / 24 hr; RH (ASTM F2170) = 99%.

Surface preparation: Concrete mechanically profiled to ICRI CSP 3; new concrete allowed to dry 28 days minimum.

Anti-slip: For best results, add Anti-Slip to top coat. For recommendations, visit kretus.com/anti-slip.

SYSTEM COMPOSITION

LAYER	PRODUCT	FUNCTION
TOP COAT	Kretus Select Nanotube ESD Kit	ESD resistance
MVR COAT	Kretus OMG Blocker Kit	Moisture resistance
TOTAL BUILD	30 mils nominal	

PERFORMANCE PROPERTIES

PROPERTY	RATING
ABRASION RESISTANCE (W/ ANTI-SLIP)	10-15 mg loss
BODY VOLTAGE GENERATION	15V
COMPRESSIVE STRENGTH	13,700 psi
CONDUCTIVE SYSTEM RESISTIVITY	>10 ⁴ to <10 ⁶ ohms
DISSIPATIVE SYSTEM RESISTIVITY	>10 ⁶ to <10 ⁹ ohms
IMPACT RESISTANCE	120 in-lbs
MICROBIAL RESISTANCE	passes, 0 growth
TRACTION WITH ANTI-SLIP	meets ADA (0.6)
TENSILE STRENGTH	7,800 psi
TEMPERATURE — INTERMITTENT (3/16")	-13 to 176°F
FLEXURAL STRENGTH	9,000 psi
INDOOR/OUTDOOR	both
FOOT TRAFFIC READY	24–36 hrs.
VEHICLE TRAFFIC READY	7 days

Disclaimer: This document is intended for Kretus-trained professionals. It is not legally binding and does not remove the user's or specifier's responsibility to ensure materials are used appropriately for the project and job site. Always follow the most current industry standards and Kretus technical guidelines. Note: Subject to change without notice. For the latest version, visit kretus.com.



THOUGHTFULLY DESIGNED COATINGS

SECTION 09 67 23
RESINOUS FLOORING – STATIC CONTROL SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Resinous Flooring and Coatings: Static Control System with Moisture Vapor Emission Control.
 - 1. Nominal Thickness: 30 mils. Static Control Nanotube MVR-TS.
 - a. A low-odor, 2-component system that can be adapted for hot and cold climates.
 - b. A low-odor, 2-component system that can be adapted for hot and cold climates.
 - c. A multi-component, static-control nanotube top coat available as Epoxy or Polyaspartic (Poly), in Conductive and Dissipative versions.

1.2 RELATED SECTIONS

- A. Section 03 30 00: Cast-in-Place Concrete.
- B. Section 03 39 00: Concrete Curing.
- C. Section 07 95 00: Expansion Control.

1.3 REFERENCES

- A. American National Standards Institute related to Electrostatic Discharge (ANSI/ESD):
 - 1. ANSI/ESD S20.20: Electrostatic Discharge Standard.
 - 2. ANSI/ESD S7.1: Floor Materials - Resistive Characterization of Materials.
 - 3. ANSI/ESD STM 97.1: Floor Materials and Footwear - Resistance in Combination with a Person.
 - 4. ANSI/ESD STM 97.2: Floor Materials and Footwear - Voltage Measurement in Combination with a Person.
- B. ASTM International (ASTM):
 - 1. ASTM D7234: Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - 2. ASTM F3010: Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Covering.
 - 3. ASTM F710: Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring.

1.4 SUBMITTALS

- A. Submit under the provisions of Section 01 30 00.
- B. Product Data: Submit Manufacturer's data sheets and supporting information for each product and specified process including:
 - 1. Approved Applicator.
 - 2. Completed Jobsite Checklists and Reports (kretus.com/pre-and-post-job-checklists).
 - 3. Certificate of Compliance (quality control document for the goods specified herein).
 - 4. Technical Data Sheets (kretus.com/technical-data-sheets).
 - 5. Safety Data Sheets (kretus.com/safety-data-sheets).

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6. Installation Guides (kretus.com/installation-guides).
 7. Maintenance and Cleaning Guide (kretus.com/project-planning).
 8. Warranty Information.
 9. Meeting Minutes: Preinstallation Conference.
- C. Samples: A 12-inch square sample of the proposed system. Color, texture, and thickness shall be representative of the overall appearance of the finished system as described in section 1.1A.
- D. Test reports of cured products showing VOC Emission compliance with USGBC LEED Version 4, performed.
- E. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum of 15 years' documented experience.
1. Manufacturer may provide a trained installation professional with knowledge of each product listed herein or any material that has been specified or provided.
- B. Applicator Qualifications: Manufacturer-trained professional applicator. The approved applicator must have no less than five years' experience with similar projects and complexity and be capable of handling installations of similar nature in all phases: surface preparation, product application, finishing procedure, safety, and work ethic.
- a. Manufacturer-Trained Professional Applicator:
 - 1) Company: _____.
 - a) Contact Name: _____.
 - 1) Phone: (____) ____-____.
 - 2) Email: _____.
 2. If concrete slabs have a history of existing floor failures, identify the cause of failure. Identifying the causes may require core samples to be taken and to be analyzed by a qualified laboratory. The Manufacturer must be consulted for core extraction procedures and results.
- C. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.
1. Materials used must be manufactured, approved, and distributed by KRETUS; Email: info@kretus.com; Tel: 714-694-2061; Web: <https://www.kretus.com>. No other parties shall be allowed without written approval.
- D. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
1. Use the mock-up to demonstrate the quality and finished look of the system.
 - a. A minimum of 50 SF unless otherwise specified by Manufacturer or Architect.
 - b. Employ the same materials, tools, and methods used in the installation.
 - c. Product direct-to-concrete adhesion needs to be verified per ASTM D7234. Before proceeding with the installation, the results must be greater than 200 psi with concrete failure. The Manufacturer reserves the right to request additional mockup and testing.
 - d. Product needs to be verified per ANSI/ESD S7.1. Before proceeding with the installation, the results must be greater than 2.5×10^4 and less than 1.0×10^6 ohms for conductive systems. Results must be greater than 1.0×10^6 and less than 1.0×10^9 ohms for dissipative systems.
 2. If the mock-up is not acceptable, rebuild it until satisfactory results are achieved.

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3. Keep mock-up on-site to compare with finished work.
4. Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

- A. Convene a conference approximately two weeks before the scheduled commencement of the Work. Attendees shall include Applicator, General Contractor, Facility Owner, Manufacturer or Manufacturer Representatives, Designer, Architect, and any responsible parties discussed for clarification of this specification. Include supporting documents relating to this specification or the project itself. The agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 1. All components delivered to the site shall be clearly marked with the product name and batch number, free of damage, and in the original Manufacturer's packaging.
 2. All product safety data sheets, bills of lading, and any dangerous goods declaration documents must be included with product and project documents.
- B. Storage and Protection:
 1. The jobsite shall provide a storage location for all components. The area shall be clearly marked, dry, out of direct sunlight and inclement weather, free of obstruction, and kept between 60 degrees F and 80 degrees F.
 2. Copies of Safety Data Sheets (SDS) for all components shall be kept on site for review by the EH and S, department of health, or responsible party.
- C. Waste Disposal:
 1. There shall be adequate disposal on the jobsite for non-hazardous waste generated during the project.
- D. Handling:
 1. All Safety Data Sheets shall always be adhered to.
 2. All materials are to be treated as dangerous substances without firsthand knowledge. No untrained personnel shall touch, relocate, or use the materials without proper training or supervision.
 3. No congregating, eating, smoking, or drinking of any kind is allowed on or near the materials.

1.8 PROJECT CONDITIONS

- A. If any of the following requirements are not met, the Manufacturer must be consulted before the installation begins.
- B. Site Requirements:
 1. The installation may proceed only when the ambient relative humidity of the site is less than 85 percent, the temperatures of the air, material, and substrate are between 40 degrees F and 90 degrees F, and the substrate temperature is at least 5 degrees F above the dew point.
 2. The site shall be free of other trades during and for 24 hours after installation.
 3. The Approved Applicator shall be supplied with adequate lighting equal to the final lighting level during the preparation and installation of the system.
 4. The Approved Applicator shall ensure that the site is properly ventilated and shall provide its own power and any necessary equipment to get the job done correctly and in a timely manner.
- C. Safety Requirements:
 1. All open flames and spark-producing equipment shall be removed from the work area prior to the commencement of installation.

2. "No Smoking" signs shall be posted at the entrances to the work area.
 3. The Facility Owner shall be responsible for removing foodstuffs from the work area.
 4. Non-related personnel in the work area shall be kept to a minimum.
- D. Existing Concrete Substrate Requirements:
1. Measure compressive strength according to ASTM C805. Acceptable results: Minimum 3,000 psi.
 2. Measure pH according to Test Method ASTM F710. Acceptable Results: 8-14.
 3. If contamination is present or suspected, test the concrete and analyze compounds that may affect the coating's ability to bond. Acceptable methods include but are not limited to petrographic examination according to ASTM C856.
 4. The Facility Owner, Engineer, and/or General Contractor must be notified and advised of potential costs of testing to meet Manufacturer specifications.
- E. Moisture Testing Requirements:
1. Perform an anhydrous calcium chloride test, ASTM F1869-98. The installation may proceed only when the MVER (moisture vapor emission rates) is less than or equal to 25 lbs/1,000 SF/24 hrs.
 2. Perform RH (relative humidity) test using in situ probes, ASTM F2170. The installation may proceed only when the RH level is less than or equal to 99 percent.
 3. If vapor emission exceeds the Manufacturer's specified RH or MVER requirements, the Facility Owner, Engineer, and/or General Contractor must be notified of potential additional costs to lower moisture values to meet Manufacturer's specifications.

1.9 WARRANTY

- A. Manufacturer's standard materials warranty unless indicated otherwise.
- B. Approved Applicator shall furnish a warranty for workmanship.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Kretus Inc., which is located at: 1055 W. Struck Ave., Orange, CA 92867; Tel: 714-694-2061; Email: info@kretus.com; Web: <https://www.kretus.com>.
- B. Additional Contacts:
 1. For English: Michael Mulnix, Senior Technical Product Manager. Email: michael@kretus.com; Phone: 916-757-4075.
 2. Para Espanol: Jaime Monarres, Senior Product Manager. Email: jaime@kretus.com; Phone: 424-348-5127.
- C. Substitutions: Not permitted.

2.2 RESINOUS FLOORING

- A. Basis of Design: Static Control Nanotube MVR-TS manufactured by Kretus.
 1. Total Nominal Thickness: 30 mils.
 2. MVR Coat: KRETUS TOP SHELF EPOXY MVR.
 - a. A low-odor, 2-component system that can be adapted for hot and cold climates.
 3. Base Coat: KRETUS TOP SHELF EPOXY.
 - a. A low-odor, 2-component system that can be adapted for hot and cold climates.
 4. Top Coat: KRETUS SELECT ESD NANOTUBE.
 - a. A multi-component, static-control nanotube top coat available as Epoxy or Polyaspartic (Poly), in Conductive and Dissipative versions.
 - b. Colorant: Included in KRETUS SELECT ESD boxed kit.

- 1) Colors: As determined by the Architect or the Facility Owner.
5. Grounding Materials:
 - a. Copper tape.
6. Product Requirements: Typical Values.
 - a. Abrasion Resistance (ASTM D4060): Select ESD Epoxy (40 mg loss); Select ESD Poly (10 mg loss).
 - b. Abrasion Resistance with Anti-Slip (ASTM D4060): Select ESD Epoxy (15 mg loss); Select ESD Poly (4 mg loss).
 - c. Adhesion Strength (ASTM D4541): 400 psi, concrete failure.
 - d. Body Voltage Generation (ANSI/ESD STM 97.2): Select ESD Epoxy (Passed, $<\pm 10$ volts); Select ESD Poly (Passed, Conductive: $<\pm 10$ volts, Dissipative: $<\pm 15$ volts).
 - e. Coefficient of Friction (ASTM D2047): Based on top coat texture (see kretus.com/anti-slip).
 - f. Compressive Strength (ASTM D695): 13,700 psi.
 - g. Electrostatic Decay (MIL-STD-3010C, Method 4046): Passed (<0.1 second).
 - h. Electrostatic Resistance - Flooring (ANSI/ESD STM 7.1): Passed (Conductive: $>2.5 \times 10^4$ to $<1.0 \times 10^6$ ohms; Dissipative: $>1.0 \times 10^6$ to $<1.0 \times 10^9$ ohms).
 - i. Electrostatic Resistance in Combination with a Person - Flooring and Footwear (ANSI/ESD STM 97.1): Passed ($<1.0 \times 10^9$ ohms).
 - j. Flame Spread/Critical Flux (ASTM E648): Class 1.
 - k. Flame Spread/Rate of Burning (ASTM D635): Self-extinguishing.
 - l. Flexural Strength (ASTM D790): 9,000 psi.
 - m. Hardness, Konig (ASTM D4366): Select ESD Epoxy (not applicable); Select ESD Poly (170).
 - n. Hardness, Shore D (ASTM D2240): Select ESD Epoxy (85); Select ESD Poly (not applicable).
 - o. Impact Resistance (ASTM D2794): 120 in-lbs.
 - p. Indoor Air Quality (CA 01350): Compliant.
 - q. Microbial Resistance (ASTM G21): Passes, 0 growth.
 - r. Modulus of Elasticity (ASTM D790): 5.0×10^5 psi.
 - s. Moisture Vapor Emission Rate (ASTM F1869): Depends on hardener: TH = 3 lbs; non-MVRs = 10 lbs; MVR = 25 lbs.
 - t. Moisture Vapor Permeance (ASTM E96): Depends on hardener: MVRs = 0.059 perms; other hardeners = 0.08 perms.
 - u. Relative Humidity (ASTM F2170): Depends on hardener: MVRs = 99 percent; other hardeners = 80 percent.
 - v. Tensile Elongation at Break (ASTM D638): 0.05.
 - w. Tensile Strength (ASTM D638): 7,800 psi.
 - x. Thermal Coefficient of Linear Expansion (ASTM D696): 18.0×10^{-6} in/in/F.
 - y. UV Resistance (ASTM D4587): Select ESD Epoxy (not recommended); Select ESD Poly (Level 2).
 - z. Water Absorption (ASTM D570): $<0.05\%$.
 - aa. Yellowing Resistance (ASTM G154): Select ESD Epoxy (not recommended); Select ESD Poly (< 3.0 DeltaE, gray, color tested for visible changes).

2.3 AUXILIARY MATERIALS

- A. Repair Materials: To repair surface imperfections before installation.
 - 1. Shallow Fill and Patching: Less than 1/4 inch deep.
 - a. KRETUS TOP SHELF EPOXY.
 - b. KRETUS URETHANE POLYMER CONCRETE RC.
 - c. KRETUS URETHANE POLYMER CONCRETE SL.
 - 2. Deep Fill and Patching: Greater than 1/4 inch (6.35 mm) deep.
 - a. 30-mesh, clean, kiln-dried sand.
 - b. KRETUS TOP SHELF EPOXY PATCH.
 - c. KRETUS TOP SHELF EPOXY.
 - d. KRETUS URETHANE POLYMER CONCRETE SL.
 - e. KRETUS URETHANE POLYMER CONCRETE MF.
- B. Joint and Crack Fill Materials: For use after installation.
 - 1. Color: Match adjacent finished surfaces.
 - 2. Shallow Fill / Patching: Less than 1/4 inch deep.
 - a. KRETUS POLY PATCH or JOINT FILLER.
 - b. KRETUS TOP SHELF EPOXY.
 - c. KRETUS URETHANE POLYMER CONCRETE RC.
 - d. KRETUS URETHANE POLYMER CONCRETE SL.
 - 3. Deep Fill / Patching: Greater than 1/4 inch deep.
 - a. 30-mesh, clean, kiln-dried sand.
 - b. KRETUS TOP SHELF EPOXY PATCH.
 - c. KRETUS TOP SHELF EPOXY.
 - d. KRETUS URETHANE POLYMER CONCRETE SL.
 - e. KRETUS URETHANE POLYMER CONCRETE MF.
- C. Prime Coat: The prime coat is required when concrete is very porous, in poor condition, or when outgassing is suspected or prevalent.
 - 1. KRETUS TOP SHELF EPOXY.
- D. Application Tools:
 - 1. Seymour Midwest Rake; <https://www.seymourmidwest.com>.
 - a. Blades/squeegee.
 - b. Loop roller.
 - c. Spiked roller.
 - d. CAM set and gauge rake.
 - e. Trowel.
 - 2. The Wooster Brush Company; <https://www.woosterbrush.com>.
 - a. Non-shed nap rollers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until the substrates have been properly constructed and prepared.
 - 1. Verify project site conditions under Section 01 00 00.
- B. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
- C. Coordinate with adjacent trades to ease construction process.

3.2 PREPARATION

- A. Prevent damage to substrate during preparation.
- B. Prepare surface in accordance with manufacturer's instructions.

3.3 MIXING

- A. Follow Manufacturer's printed instructions. Careful measurements and thorough mixing are essential for a proper cure.
- B. Review KRETUS Mixing Station Guide for general handling, storage, and preparation procedures.

3.4 INSTALLATION

- A. Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.
- B. Grounding: Coordinate with a certified electrician to ensure all copper grounds are attached to the common ground before installing ESD Topcoat.
- C. Static Control Resinous System: Nanotube MVR-TS, 30 mils.
 - 1. MVR Coat:
 - a. Mix coating according to Manufacturer instructions.
 - b. Apply with 15-20 WFT-mil blade. Smooth application with 3/8-inch non-shed nap roller.
 - 1) Yields 100 SF/gal.
 - 2. Base Coat:
 - a. Mix coating according to Manufacturer instructions.
 - b. Apply with 8-12 WFT-mil blade. Smooth application with 3/8-inch non-shed nap roller.
 - 1) Yields 150 SF/gal.
 - 3. Top Coat:
 - a. Mix coating according to Manufacturer instructions.
 - b. Apply with 5-7 WFT-mil blade, pushing the coating across the surface (do not pull the coating). Cross-roll with 3/8-inch non-shed nap roller.
 - 1) Yields 500 SF/kit.

3.5 AUXILIARY MATERIAL INSTALLATION

- A. Repair Materials: Install in accordance with Manufacturer's recommendations.
- B. Joint and Crack Fill Materials: Install in accordance with Manufacturer's recommendations.
- C. Prime Coat: Install in accordance with manufacturer's recommendations.
- D. Integral Cove Base (only if specified): Follow Manufacturer's preparation and application guidelines to provide an integral cove base at height indicated.

3.6 FIELD QUALITY CONTROL

- A. Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.
- B. Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.
- C. The following tests and reporting are to be conducted by the Approved Applicator:
 - 1. Condition of the area being installed.
 - 2. Temperature: Date, time, air temperature, concrete surface temperatures, dew point.
 - 3. Product installed and coverage rates.
 - 4. Batch number of all materials.

5. Project report shall be submitted upon completion of the work.
- D. Adhesion tests of the first coat applied to the concrete per ASTM D7234 must show substrate failure with a minimal pull of 200 psi.
- E. For conductive ESD systems, resistivity testing per ANSI/ESD S7.1 must be greater than 2.5×10^4 and less than 1.0×10^6 ohms. For dissipative ESD systems, surface resistivity testing per ANSI/ESD S7.1 must be greater than 1.0×10^6 and less than 1.0×10^9 ohms. Complete additional ANSI/ESD testing as required by the Facility Owner.
- F. Replica of the system as installed must be provided to Manufacturer for approval and warranty.
- G. Facility Owner reserves the right to invoke material testing procedures at any time and any number of times during the application process.
- H. Facility Owner may engage service of an independent testing laboratory to sample materials being used on the jobsite. Samples of material may be taken, identified, and certified in the presence of the Approved Applicator.

3.7 **CLEANING, CURING, AND PROTECTION**

- A. Cleaning:
 1. Perform detailed cleaning at floor termination to leave a cleanable surface for subsequent work of other sections.
 2. Remove any spillage of cured and uncured materials from the site with a suitable solvent. Dispose of any temporary floor covering and leftover materials in accordance with federal, local, and building requirements.
- B. Curing and Protection:
 1. After completion of an application, do not allow traffic on coated surfaces for a period of 24 hours.
 2. Allow material to cure in compliance with Manufacturer instructions, taking care to prevent contamination during the installation and curing process.
 3. "Return to Service" means the system can be walked on. However, typical resinous coatings require 7 days at 70 degrees F to reach full cure. During this period, standing water, caustic chemicals, cleaning, or heavy traffic should be avoided as it may cause permanent damage to the finish.

END OF SECTION