

SECTION 23 30 13.00 20

DUCTWORK AND DUCTWORK ACCESSORIES

06/07

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AIR MOVEMENT AND CONTROL ASSOCIATION INTERNATIONAL (AMCA)

- AMCA 500-D** (1998) Laboratory Methods of Testing Dampers for Rating
- AMCA 501** (2003) Application Manual for Air Louvers

AIR-CONDITIONING AND REFRIGERATION INSTITUTE (ARI)

- ARI 260** (2001; R 2002) Sound Rating of Ducted Air Moving and Conditioning Equipment
- ARI 300** (1988; R 2000) Sound Rating and Sound Transmission Loss of Packaged Terminal Equipment

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

- ASHRAE 90.1** (2004; various Errata) Energy Standard for Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

- ASTM A 167** (2004) Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- ASTM A 653/A 653M** (2004a) Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM B 152/B 152M** (2000) Copper Sheet, Strip, Plate, and Rolled Bar
- ASTM B 209** (2004) Aluminum and Aluminum-Alloy Sheet and Plate
- ASTM C 1071** (2000) Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
- ASTM C 423** (2002a) Sound Absorption and Sound Absorption Coefficients by the

Reverberation Room Method

- ASTM C 553 (2002) Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- ASTM E 437 (1992; R 1997) Industrial Wire Cloth and Screens (Square Opening Series)
- ASTM E 90 (2004) Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- ASTM E 96 (2000e1) Water Vapor Transmission of Materials

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

- NFPA 90A (2002) Installation of Air Conditioning and Ventilating Systems

SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

- SMACNA HVAC Duct Const Stds (1995, 2nd Ed) HVAC Duct Construction Standards - Metal and Flexible
- SMACNA Seismic Restraint Mnl (1998, 2nd Ed) Seismic Restraint Manual: Guidelines for Mechanical Systems

UNDERWRITERS LABORATORIES (UL)

- UL 181 (2005) Factory-Made Air Ducts and Air Connectors
- UL 555 (1999; Rev thru Jan 2002) Fire Dampers
- UL 555S (1999; Rev thru Apr 2003) Smoke Dampers

1.2 RELATED REQUIREMENTS

Section 23 03 00.00 20 BASIC MECHANICAL MATERIALS NAD METHODS, applies to this section with the additions and modifications specified herein.

1.3 PRESSURE CLASSIFICATION

SMACNA HVAC Duct Const Stds, Section 1, and as indicated.

1.4 SYSTEM DESCRIPTION

Provide ductwork systems including ductwork, ductwork hangers and supports, equipment, materials, installation, workmanship, fabrication, assembly, erection, and inspection, shall be in accordance with SMACNA HVAC Duct Const Stds as modified and supplemented by the specifications and drawings.

1.4.1 Design Requirements

1.4.1.1 Louvered Penthouse

Submit test report for withstanding 125 mph wind force.

1.4.1.2 Automatic Dampers

Submit certification of damper leakage testing and conformance with AMCA 500-D and specified maximum leakage or pressure drop requirements.

1.4.1.3 Sound Pressure Level Rating

Submit for inlets and outlets including diffusers, registers and grilles.

1.4.1.4 Sound Attenuators and Attenuator Ducts Acoustical Tests

Submit certified test data from an independent acoustical testing laboratory, listing sound noise reduction characteristics, static pressure drop, air flow velocity capacity, and insertion loss data.

1.4.1.5 Plenum or Casing Acoustical Tests

Submit as required in paragraph entitled "Casings and Plenums."

1.5 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Dampers

Fire dampers

Automatic Smoke-Fire Dampers

Automatic smoke dampers

Sound attenuators

Flexible ducts and connectors

Insulation and vapor barrier

Louvers

Louvered penthouse

Bird screens

Diffusers, registers, and grilles

SD-08 Manufacturer's Instructions

Ductwork and ductwork accessories

1.6 QUALITY ASSURANCE

1.6.1 Modification of References

SMACNA Duct Construction Manuals: The SMACNA recommendations shall be considered as mandatory requirements. Substitute the word "shall" for the word "should" in these manuals.

1.6.2 Ductwork and Ductwork Accessories

Submit manufacturer's instruction including job inspection checklist, methods of on-site storage and handling, and recommended repair methods.

1.6.3 Acoustical Performance

Provide full octave bands of airflow generated noise for each rate and direction of airflow of design performance in accordance with ARI 260 (for ducted equipment) ARI 300 (for terminal equipment). Indicate pressure drop across the silencing element for each airflow rate.

PART 2 PRODUCTS

2.1 METAL DUCTS

2.1.1 Steel Ducts

Degrease sheet metal air ducts using mild dishwashing liquid with a heated high-pressure sprayer. ASTM A 653/A 653M galvanized steel sheet, lock-forming quality; coating designation G90.

2.1.2 Aluminum Ducts

ASTM B 209 alloy 3003-H14 for aluminum sheet and alloy 6061-T6 or equivalent strength for aluminum connectors and bar stock.

2.1.3 Copper Sheets

ASTM B 152/B 152M, light cold rolled temper.

2.1.4 Corrosion Resisting (Stainless) Steel Sheets

ASTM A 167.

2.1.5 Duct Insulation

Duct insulation shall be in accordance with ASHRAE 90.1 requirements, at a minimum.

2.1.6 Mold/Mildew Growth Management

Duct liner is not permitted.

2.2 DUCTS OF PRESSURE CLASSES 3 INCH WATER GAGE OR LESS

Except as specified or indicated otherwise, construction, metal gage,

hangers and supports, and reinforcements shall conform with **SMACNA HVAC Duct Const Stds**, except that ducts with pressure classifications below **2 inch water** gage that are located outside of the conditioned space shall have a seal class C. Ductwork shall be airtight and shall not vibrate or pulsate when system is in operation. Pressure sensitive tape shall not be used as a primary sealant on ductwork with pressure classifications above **one inch water** gage. Air leakage shall be less than 5 percent of the system capacity. Construct ductwork of galvanized steel.

2.2.1 Curved Elbows

Make a centerline radius not less than 1 1/2 times the width or diameter of the duct.

2.2.2 Laps

Make laps at joints in the direction of air flow. Space button-punch or bolt-connection in standing seams at fixed centers not greater than **6 inches**. Longitudinal locks or seams, known as "button-punch snap-lock," may be used in lieu of Pittsburgh Lock.

2.2.3 Fittings

Provide elbows, vaned elbows, take-offs, branch connections, transitions, splitters, volume dampers, fire dampers, flexible connections, and access doors. Provide factory fabricated airtight, and noncorrosive test holes with screw cap and gasket.

2.2.4 Acoustical Attenuator Systems

2.2.4.1 Net Noise Reduction Values

Conform with the following:

Minimum Net Noise Reduction Values,
Sound Pressure Level dB
(Reference Sound Power at 10-12 Watts)

Octave Pass Band	2	3	4	5	6	7
Center-Frequency (Hz)	125	250	500	1000	2000	4000
Noise Reduction (dB)	11	16	19	30	40	32

2.2.4.2 Factory-Fabricated Sound-Attenuator Ducts

Sound-attenuator ducts may be provided in lieu of sound attenuators. Comply with requirements specified herein for sound attenuators. Provide double-walled duct and fitting of an outer zinc-coated metal pressure shell with **one inch** thick acoustical blanket insulation and an internal perforated zinc-coated metal liner. Install sufficient length of run to obtain the noise reduction value specified. Furnish certification from manufacturer that the sound reduction values specified will be obtained within the length of duct run provided. The internal perforated zinc-coated metal-liner shall be not less than 24 gage, unless ribbed, then not less than 28 gage for the duct liner and not less than 26 gage for the fitting liner with perforations not larger than **3/32 inch** diameter. Seal joints as specified in paragraph entitled "Round and Oval Ducts."

2.2.4.3 Sound Attenuators (Traps)

Provide factory-fabricated attenuators constructed of galvanized steel sheets. Outer casing shall be not less than 22 gage. Acoustical fills shall be mineral fiber conforming to [ASTM C 1071](#). Air flow capacities shall be as indicated. Pressure drops through attenuators shall not exceed values indicated, or shall be not in excess of 15 percent of the total external static pressure of the air handling system, whichever is less. Acoustically test sound attenuators with metal duct inlet and outlet sections while under rated air flow conditions. Noise reduction data shall include effects of flanking paths and vibration transmission. Attenuators shall be airtight when operating at internal static pressure not less than [2 inches water](#) gage. Conform with noise reduction requirements specified in paragraph entitled "Net Noise Reduction Values."

2.3 FLEXIBLE DUCTS AND CONNECTORS

[UL 181](#), Class I, UL listed, and additional requirements herein specified. Provide to connect between rigid ducts and outlets or terminals. There shall be no erosion, delamination, loose fibers, or odors from the ducts into the air stream. At [250 degrees F](#), minimum rating pressures shall be [2 inches water positive and 1/2 inch negative, up to 2500 fpm](#). Flexible ducts shall be maximum [6 feet](#) in length. Minimum bend radius shall be twice the duct diameter.

2.3.1 Materials

Interlocking spiral or helically corrugated type constructed of zinc-coated steel, [or corrosion-resistant steel.](#),

2.3.2 Insulation and Vapor Barrier

[ASTM C 553](#) Type 1, Class B-2, minimum [one inch](#) nominal thickness and [three-quarter lb./cu. ft.](#) density. Sheathe insulation with a vapor barrier having a maximum water vapor permeance of 0.20 perm in accordance with [ASTM E 96](#), Procedure A. Coat ends of insulation with cement to prevent erosion and delamination.

2.3.3 Joints

Make airtight slip joints, seal with pressure-sensitive vapor-seal adhesive tape or duct sealer, and secure with sheet metal screws. To prevent insulation compression, place [2 inch wide by one inch thick](#) closed cell foam plastic spacers over joints under vapor barriers. To provide a vaportight joint, provide a corrosion-resistant steel clamp over such spacers.

2.4 CASINGS AND PLENUMS

Factory fabricated components with field installation. Furnish certified testing data from plenum or casing manufacturer obtainable directly from an independent acoustical laboratory, listing sound absorption and transmission loss characteristics of panel assembly. Sound absorption coefficients and sound transmission loss, determined by an independent laboratory, shall be in accordance with [ASTM C 423](#) and [ASTM E 90](#) respectively.

2.5 DIFFUSERS, REGISTERS, AND GRILLES

2.5.1 Material and Finishes

Provide factory-furnished diffusers, registers, and grilles constructed of aluminum in non-rated ceilings and steel in rated ceilings. Exterior and exposed edges shall be rolled, or otherwise stiffened and rounded. Steel parts shall be factory zinc phosphate treated prior to priming and painting or have a baked-on enamel finish. Colors shall be selected or approved by Contracting Officer. In fire rated ceilings, provide radiation damper and fire blanket.

2.5.2 Sound Pressure Level

Manufacturer certified sound pressure level rating of inlets and outlets. Conform with the following permissible room sound pressure levels:

NC Range, dB	Typical Application
As indicated on drawings	As indicated on drawings.

2.5.3 Throw

The distance from the diffuser, register, or grille to the point which the air velocity falls below 50 feet per minute shall not exceed 1.5 times the outlet mounting height.

2.5.4 Drop

Maximum drop of air stream shall not be within 6 feet of the floor at the end of the throw.

2.5.5 Ceiling Diffusers

Equip with baffles or other devices required to provide proper air distribution pattern as indicated. Provide factory-fabricated, single key, volume dampers. Except for linear diffusers, internal parts shall be removable through the diffuser neck for access to the duct and without the use of special tools.

2.5.5.1 Circular, Square, and Rectangular Diffusers

Construct each ceiling diffuser of four or more concentric elements designed to deliver air in a generally horizontal direction without excess smudging of the ceiling. Interior elements of square and rectangular ceiling diffusers may be circular, square, or rectangular as manufacturer's standard.

2.5.5.2 Linear Diffusers

Joints between diffuser sections shall appear as hairline cracks. Provide alignment slots for insertion of key strips or other concealed means to align exposed butt edges of diffusers. Equip with plaster frames when mounted in plaster ceiling. Do not use screws and bolts in exposed face of frames or flanges. Frames and flanges exposed below ceiling shall be metal-filled and ground smooth. Furnish separate pivoted or hinged adjustable air-volume-damper and separate air-deflection blades.

2.5.6 Registers

Double-deflection supply registers. Provide manufacturer-furnished volume dampers. Volume dampers shall be of the group-operated, opposed-blade type and key adjustable by inserting key through face of register. Operating mechanism shall not project through any part of the register face. Automatic volume control devices will be acceptable. Provide exhaust and return registers as specified for supply registers, except that exhaust and return registers shall have a single set of nondirectional face bars or vanes having the same appearance as the supply registers. Set face bars or vanes at 45 degrees.

2.5.7 Grilles

Construct and finish as specified above for registers, except that volume dampers shall be omitted.

2.6 DUCT SLEEVES, PREPARED OPENINGS, AND CLOSURE COLLARS

2.6.1 Duct Sleeves

Fabricate from minimum 20 gage galvanized steel. Where sleeves are installed in bearing walls, provide structural steel sleeves as indicated. Size sleeves to provide one inch clearance between duct and sleeve or between insulation and sleeve for insulated ducts.

2.6.2 Prepared Openings

Provide one inch clearance between the duct and the sleeve, or one inch clearance between insulation and sleeve for insulated ducts except at grilles, registers, and diffusers.

2.6.3 Packing

ASTM C 553, Type 1, Class B-2, mineral fiber.

2.6.4 Closure Collars

Four inches wide minimum, fabricated from minimum 20 gage galvanized steel.

2.7 DEFLECTORS

Factory-fabricated and factory- or field-assembled units consisting of curved turning vanes for uniform air distribution and change of direction with minimum turbulence and pressure loss. Provide curved vanes for square elbows. For round ducts taking off from rectangular ducts, provide factory fabricated, galvanized sheet metal, spin-in fittings. These fittings shall have factory-assembled damper with positive locking regulator. Provide with accessory insulation guard where tapping into internally insulated ductwork.

2.8 ACCESS DOORS

Door shall be rigid and airtight with neoprene gaskets and two or more galvanized steel hinges and quick fastening locking devices. Provide doors as large as practical. Mount doors, if possible, so that air pressure holds them closed. As an alternative, removable access doors may be used. These access doors shall be constructed from stamped sheet metal and consist of an inner and outer door panel. Where insulated doors are

needed, the inner door shall consist of two panels spot-welded together which totally encapsulate fiberglass insulation. The inner and outer doors shall be joined by bolts and threaded handles in such a configuration that the panels can be drawn together to secure the door to the duct in a sandwich fashion. The handles shall be high impact plastic with threaded metal inserts. Conical springs shall be used between the door panels to facilitate installation and removal of the door. Neoprene gasket shall be used around the outside edge of the inner or outer panel, but not both, to seal the door. This type of door is approved for use on rectangular, round and flat-oval ductwork.

2.9 DAMPERS AND LOUVERS

Construct dampers and louvers with galvanized sheet metal two gages heavier than ducts in which installed. Except as modified herein, the construction shall be of aluminum or galvanized steel with interlocking edges and maximum 10 inch blade width. Dampers shall be opposed-blade type. Damper blades shall be connected to the damper frame with a non-metallic anti-friction bushing. The blades shall be connected to the frame with a galvanized, zinc coated steel anti-friction bearing pin. The pin shall consist of a single or double row sealed, stainless steel, maintenance free, roller or ball bearing, lubricated for life with a full stroke test of 200,000 or more strokes in accordance with UL 555S. The bearing shall be pressed onto a steel shaft via a knurled stud. A slotted dowel pin is then inserted thru a hole connecting the two pins.

2.9.1 Backdraft Dampers (Gravity Dampers or Shutters)

Factory-fabricated, with statically balanced blades that open automatically when the fan starts and close by gravity when the fan stops. Provide the edges of blades with felt or rubber strips to prevent rattling.

2.9.2 Manual Volume Dampers

Balancing, factory-fabricated type. Equip dampers with accessible mechanism such as quadrant operators or 3/16 inch rods brought through the side of ducts with locking setscrew and bushing. Where quadrant operators are furnished, provide chrome plated or enamel painted type with exposed edges rounded.

2.9.3 Fire Dampers

Provide in accordance with UL 555.

2.9.4 Automatic Smoke-Fire Dampers

Multiple blade type, 180 degrees F fusible fire damper link; smoke damper assembly to include pneumatically powered operator. UL 555 as a 1 1/2 hour rated fire damper; further qualified under UL 555S as a leakage rated damper. Leakage rating under UL 555S shall be no higher than Class III at an elevated temperature Category B (250 degrees F for 30 minutes). Pressure drop in the damper open position shall not exceed 0.1 inch w.g. with average duct velocities of 2500 fpm.

2.9.5 Automatic Smoke Dampers

UL listed multiple blade type, supplied by smoke damper manufacturer, with pneumatic damper operator as part of assembly. Qualified under UL 555S with a leakage rating no higher than Class III at an elevated temperature

category B (250 degrees F for 30 minutes). Pressure drop in the damper open position shall not exceed 0.1 inch w.g. with average duct velocities of 2500 fpm.

2.9.6 Automatic Dampers

Section 23 09 54.00 20 DIRECT DIGITAL CONTROL SYSTEMS. Maximum leakage shall not exceed 10 cfm per square foot of damper face area at 2 inch w.g. pressure difference.

2.9.7 Louvers

Fixed type. Fold or bead the edges of louver blades to exclude driving rain. Louvers blades shall be oriented to minimize the entrainment of rainwater. Make louver frames of 16 gage aluminum. Provide bird (insect) screen constructed of the same type metal as the louvers.

2.9.7.1 Bird Screens

ASTM E 437, general industrial-use wire cloth, Grade C, medium light or heavier, nominal 2 mesh 0.063 inch wire diameter, galvanized steel bird screens. Provide removable insect screens of grooved type, with vinyl or neoprene spline insert for securing screen cloth.

2.9.7.2 Louvered Penthouse

Low-silhouette, curb-mounted, dome-type roof intake or exhaust unit as indicated equipped with waterproof top and rainproof louvers around the sides. Provide a removable roof constructed of not less than 0.081 inch thick aluminum steel sheet insulated with one inch thick glass fiber with vapor barrier attached to underside of roof. Internally brace the unit with not less than 2 by 2 by 1/8 inch aluminum or galvanized steel angles. Provide curb tie-downs and bird screens. The entire assembly shall have been factory tested to withstand a 125 mph wind force. Provide stainless steel bolts or screws in the assembly.

PART 3 EXECUTION

3.1 INSTALLATION

Except as specified or indicated otherwise, conform to NFPA 90A, SMACNA HVAC Duct Const Stds. Provide mounting and supporting of ductwork and accessories including, but not limited to, structural supports, hangers, vibration isolators, stands, clamps and brackets, access doors, and dampers. Provide electrical isolation between dissimilar metals. Electrical isolation may be fluorinated elastomers or sponge-rubber gaskets. Install ductwork accessories as indicated and as recommended by manufacturer's printed instruction. Allow clearance for inspection, repair, replacement, and service. Louvers in accordance with AMCA 501.

3.1.1 Ductwork

Air distribution systems shall operate with no chatter or vibration.

3.1.1.1 Field Changes to Ductwork

Those required to suit the sizes of factory-fabricated equipment actually furnished, shall be designed to minimize expansion and contraction. Use gradual transitions in field changes as well as modifications to connecting

ducts.

3.1.1.2 Dampers

When installed on ducts to be thermally insulated, equip each damper operator with stand-off mounting brackets, bases, or adapters to provide clearance between the duct and operator not less than the thickness of insulation. Stand-off mounting items shall be integral with the operator or standard accessory of damper manufacturer.

3.1.1.3 Deflectors

Provide in square elbows, duct-mounted supply outlets, and tap-in branch-off connections. Make connections from main or branch ductwork to register, grille and diffuser runout ducts with spin-in fittings. Adjust supply outlets to provide air volume and distribution as indicated.

3.1.1.4 Fire Dampers

Install in accordance with manufacturer's instructions for condition of [UL 555](#) and NFPA 90A. Locate as indicated and provide surface penetration sleeves in accordance with approved detail drawings.

3.1.1.5 Access Doors

Provide for automatic dampers, volume dampers, fire dampers, coils, thermostats, temperature controllers, valves, filters, humidifiers and other concealed apparatus requiring service and inspection in the duct systems.

3.1.1.6 Duct Sleeves, Prepared Openings, and Closure Collars

Provide for ductwork penetrations in floors, walls, and partitions through which metallic ductwork passes.

- a. Duct Sleeves: Fill space between duct and sleeve or between insulation and sleeve for insulated ducts with mineral fiber, except at grilles, registers, and diffusers.
- b. Prepared Openings: Fill space between duct and opening or between insulation and opening for insulated ducts with mineral fiber, except at grilles, registers, and diffusers.
- c. Closure Collars: Fit collars snugly around ducts or insulation. Grind edges of collar smooth to preclude tearing or puncturing insulation covering or vapor barrier. Provide nails with maximum 6 inch centers on collars.

3.1.1.7 Packing

Pack spaces between sleeve or opening and duct or duct insulation with mineral fiber.

3.1.2 Duct Hangers and Supports

[SMACNA HVAC Duct Const Stds](#), Section 4. Provide seismic restraint complying with [SMACNA Seismic Restraint Mnl](#). Attach supports only to structural framing members and concrete slabs. Do not anchor supports to metal decking unless a means is provided and approved for preventing the

anchors from puncturing the metal decking. Where supports are required between structural framing member, provide suitable intermediate metal framing. Provide retainer clips where C clamps are used.

3.1.2.1 Flexible Ducts

Support ducts by hangers every 3 feet, unless supported by ceiling construction. Stretch flexible air ducts to smooth out corrugations and long radius elbows. Provide minimum length to make connections.

3.1.2.2 Flexible Connectors

Provide flexible connectors between fans and ducts or casings and where ducts are of dissimilar metals. For round ducts, securely fasten flexible connectors by zinc-coated steel clinch-type draw-bands. For rectangular ducts, lock flexible connectors to metal collars.

3.1.3 Inspection Plates and Test Holes

Provide, where required, in ductwork or casings for all balance measurements. If possible, test holes should be located at least 7.5 times diameters downstream from a disturbance. Extend cap through insulation.

3.1.4 Thermal Insulation

Install duct insulation so that unfaced fiberglass and mineral fiber insulation are not in contact with airstream.

3.1.5 Sound Attenuators

Provide sound attenuators in the discharge duct of each high-pressure fan as indicated. For each system, provide sound attenuators to ensure that the combination of air system equipment and sound attenuation comply with the designed sound levels.

3.1.6 Flashing

Section 07600 FLASHING AND SHEET METAL.

3.1.7 Cleaning of Ducts

Clean ductwork in accordance with manufacturer's recommendations. Remove all debris and dirt from ducts and wipe clean. Before installing air outlets, force air through entire system at maximum attainable velocity to remove accumulated dust. Provide temporary air filters to protect ductwork which may be harmed by excessive dirt. For large systems, clean duct with high power vacuum machines.

3.2 FIELD QUALITY CONTROL

Administer and direct tests. Furnish instruments, equipment, connecting devices, and personnel for the tests. Notify Contracting Officer 15 days before inspection or testing is scheduled. Correct defects in work. Repeat tests until work is in compliance.

3.2.1 Duct Air Leakage Testing

Requirements for duct air leakage testing is indicated and specified in Section 23 08 00.00 20 HVAC TESTING/ADJUSTING/BALANCING.

3.3 WASTE MANAGEMENT

Separate waste in accordance with the Waste Management Plan, placing galvanized sheet metal in a designated area for reuse. Close and seal tightly all partly used adhesives and solvents; store protected in a well-ventilated, fire-safe area at moderate temperature.

-- End of Section --