Sudbury Neutrino Observatory

LABORATORY WALL AND CEILING FINISH SPECIFICATIONS (DESIGN CRITERIA)

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Report SNO STR 91-067

November 15, 1991

1. SCOPE:

In the finished laboratory and cavity top areas of the observatory, appropriately coated wall, ceiling and floor surfaces are required for cleanliness and light reflection purposes. This document outlines SNO requirements for these surfaces, and classifies the revised underground layout sections as to finish type. This classification is based on the preliminary design of the ventilation system and the assigning of laboratory rooms into three categories: clean, semi-clean and dirty. Surface finish procedures are outlined for clean and semi-clean areas, starting with the basic screen/rockbolt and 2 inch (5 cm) shotcrete layer required for ground control purposes. Prior to shotcreting, an inspection of screening is specified. In areas of concern where the screen is not close enough to the rock surface, it will be recommended that screening be pushed back against the rock, or cut and reinstalled using additional rock bolts. During shotcreting, areas for extra shotcrete fill will be identified, and a surface finish step prior to the setting of the shotcrete is specified. In some critical areas, prior to final wall coating, surface remedial work as outlined below will be specified following an inspection. Finally, specifications are given for an epoxy or other suitable paint coating for clean and semi-clean area walls and ceilings[1]. Outlines of the procedures and the areas where they are required are given in the following sections.

2. CATEGORIES OF ROOM CLEANLINESS:

The revised layout for the laboratory rooms is shown in Figure 1. During installation of the photomultiplier support structure and the acrylic vessel, when cleanliness in the cavity is required, the ventilation system will be providing clean

[1] Materials proposed in this report have not yet been considered by INCO for underground use (except for the epoxy paint). This review and approval is a necessary first step in the detailed design.

fresh air to the cavity, and recirculating much of the cavity air to produce the required air cleanliness. Slight air pressure differences will ensure that any small air flows will move from the cavity area outward. To maintain air cleanliness and to minimize the entry of dust into the cavity, the junction area, the inner parts of the change rooms, the new control room, the cavity dome area above the deck and the assembly area at the bottom of the ramp have been designated as **Clean** (Level I). The utilities room, the lunchroom, the electronics repair area, the wash station, the change room entry/locker area and the air lock exit from the ramp assembly room are **Semi-clean** (Level II) areas. A personnel entrance door is now specified beside the car wash entrance and the long corridor in front of the locker/change room entrance (see Figure 1) will also become a semi-clean room. This area will have normal shotcrete walls, a concrete floor and standard wall coating. An elevated footbath to remove mine dirt from boots shold be installed inside this entrance. The ramp and the laboratory entry drift in front of the wash station are **Dirty** (Level III). In general, clean areas are separated from dirty areas by a semi-clean area, and coated concrete floors are specified throughout the semi-clean and clean sections.

3. CATEGORIES OF ROOM SURFACES:

There are four basic types of surfaces in the SNO laboratory rooms:

(a) excavated rock walls and ceilings with ground control screen and rockbolts.
(b) interior walls (concrete block or drywall construction)
(c) suspended ceilings
(d) floors

The finish specifications for these types of surfaces are outlined below for **Clean (I)**, **Semi-clean (II)** and **Dirty (III)** sections of the laboratory.

4. SURFACE FINISH SPECIFICATIONS:

I Clean Laboratory Sections

Requirements: A smooth solid surface (paint or plastic sheet) which may contain holesand exposed ground control screen, provided that these can be sealed to prevent the release of surface dust.

(a) Clean Area Walls and Ceilings

Steps:

1. Following completion of ground control screen/rockbolts an initial inspection by SNO/INCO personnel is scheduled to identify critical areas where the screen is too far from the rock for adequate shotcrete cover, and where other covering techniques cannot be used (Figure 2).

2. The ground control screen in these identified areas, is pushed in or cut and replaced close to the rock, prior to shotcrete application.

3. Ground control shotcrete, to an average thickness of 2 inches (5 cm) is applied to cover bolts and screen as much as possible. It is recommended that a concrete finisher who would "broom" the surface and cut off sections near the floor, be added to the shotcrete crew. A SNO consultant could also be useful during this operation. Shotcrete test panels are prepared for compressive strength tests, and periodic tests of adhesion to rock surfaces are carried out as per quality control requirements.

4. An inspection of the shotcrete surface takes place. After a 2 inch shotcrete layer, it is expected that 20 - 30 % of the surface will have exposed screening, partially or fully coated with shotcrete. Tests of spray paint coverage of this type of surface are in progress. Since the main requirement in most clean/semi-clean laboratory areas is a sealed surface which can be washed down for cleaning, it is expected that most exposed screen areas will be acceptable, if paint sealing is possible. If paint coverage tests on exposed screen are not satisfactory, more surface remedial work may be needed. Minimal areas with holes or exposed screen requiring remedial work, are identified. One of the following methods is selected for each area:

(i) the parging of holes and/or screen, including optional use of finer (0.5 inch (1 cm) openings) screen backing attached to ground control screen. This method is not acceptable in ceilings according to INCO safety regulations.

(ii) the filling of voids with polyurethane foam, followed by a coating of the foam with epoxy paint. Tests of this method are in progress. Specifications of typical material are given in Appendix 4.

(iii) the covering of areas with PVC or polyester/fibreglass sheet materials, after painting is complete (see Appendix 1).

These methods are outlined in Figure 3. A normal shotcrete surface of typical smoothness (± 1/4 inch (0.6 cm)) (possibly including exposed screening), is suitable for regular paint treatment.

5. Loose particles are brushed and washed from the shotcrete surface, and any final touch-up parging is completed.

6. One coat of epoxy sealer (Appendix 2 or equivalent) is sprayed on the shotcrete surface.

7. A 1 mm (40 mil) thick coating of high-build epoxy paint (Appendix 2) or other suitable coating, is sprayed (preferably with airless spray equipment) in two coats.

(b) Interior Walls

Steps:

1. The block or drywall walls are inspected by SNO after construction, and any remedial parging is carried out.

2. Where Faraday cage screening is installed on the wall surface, a parging coat over this screen may be necessary, if sealing of the surface is not possible.

3. Walls are cleaned and/or washed prior to painting.

4. Primer and high-build epoxy paint (or other equivalent coating) are sprayed or rolled on. The use of pre-coated ceramic blocks may be a viable option.

(c) Suspended Ceilings

Suspended ceiling systems must satisfy any INCO seismic durability and fire rating specifications. Solid PVC or polyester/fibreglass panels are recommended, with frames/seals that prevent any dust from the roof from entering the clean area. A suggested layout for the wash/change rooms which includes a suspended or false ceiling, is shown in Figure 4.

(d) Floors

Steps:

1. Poured concrete floors of suitable thickness and surface (machine-trowelled) are installed for all clean areas. Depending on shotcrete finish, a curb may be needed at the wall edge of the floor (Figure 4).

2. Finished floors are inspected by SNO and any remedial patching is carried out.

3. An epoxy sealer coat is rolled on, followed by two coats of high build epoxy, or alternatively a vinyl floor covering.

II Semi-Clean Laboratory Sections

Requirements: Surfaces (coated with epoxy or other suitable paint) which may not be entirely smooth, but could contain holes and exposed screening provided that these areas can be adequately sealed.

(a) Walls and Ceilings

Steps:

1. Ground control shotcrete to an average thickness of 2 inches (5 cm) is applied as in section I, to cover as much ground control screen as possible. The use of a concrete finisher for "brooming" and cutting off shotcrete at the wall base is again recommended.

2. An inspection of the finished shotcrete surface is carried out, and minimal remedial work is identified. Exposed screening and holes that spray painting can coat, are acceptable.

3. A primer and top coat of a suitable paint is applied.

(b) Interior Walls

Steps:

1. The same procedures as for I(b) are specified, except that alternative paint substitutes could be used (as in (a)).

(c) Suspended Ceilings

Steps:

1. The same procedures as for I(c) are specified.

<u>(d) Floors</u>

Steps:

1. The same procedures as for I(d) are specified, except that the use of vinyl floor coverings is optional.

III Dirty Laboratory Sections

Requirements: Only normal ground control treatment of rock walls in this area is necessary (screening, rockbolts and optional shotcrete). Within 20 ft (6 m) of a semi-clean room entrance, the rock walls are to be cleaned, and a smooth concrete floor installed, to enable the entrance to be kept clean during the installation phase and during laboratory operations. At the main (security) entrance to the laboratory, concrete floors are specified up to the car wash doors. To protect the main entrance from any possibility of water flooding from the dirty area, a weir across the entrance drift (with a section removable for rail traffic) should be considered (possibly just inside the security doors).

5. APPENDICES:

1. Specifications for typical plastic wall coverings.
2. Shotcrete finish specifications (ACI excerpt).
3. Specifications for BMS high-build epoxy coatings.
4. Specification sheet for typical polyurethane foam filler.

6. RELATED REFERENCES:

Sudbury Neutrino Observatory, Mark II Engineering Proposal, K.M. McFarlane (ed.) (1989), section 4.2300 Rooms.

Sudbury Neutrino Observatory Design Criteria: Room Finishes, Monenco/Canatom document DC 17-220-01 (1991).

Establishing a Cleanliness Program and Specifications for the Sudbury Neutrino Observatory, E.D. Hallman and R.G. Stokstad, Report SNO-STR-91-009, (1991).

Sudbury Neutrino Observatory Design Criteria: Air Conditioning, Ventilation, Plumbing, Fire Protection, Monenco/Canatom document DC 17-622-01 (November 1991)

Sudbury Neutrino Observatory general layout - observatory drawing INCO Drawing # 17-702-B-6223-2

Figure 1: SNO revised underground laboratory layout showing room and surface designations

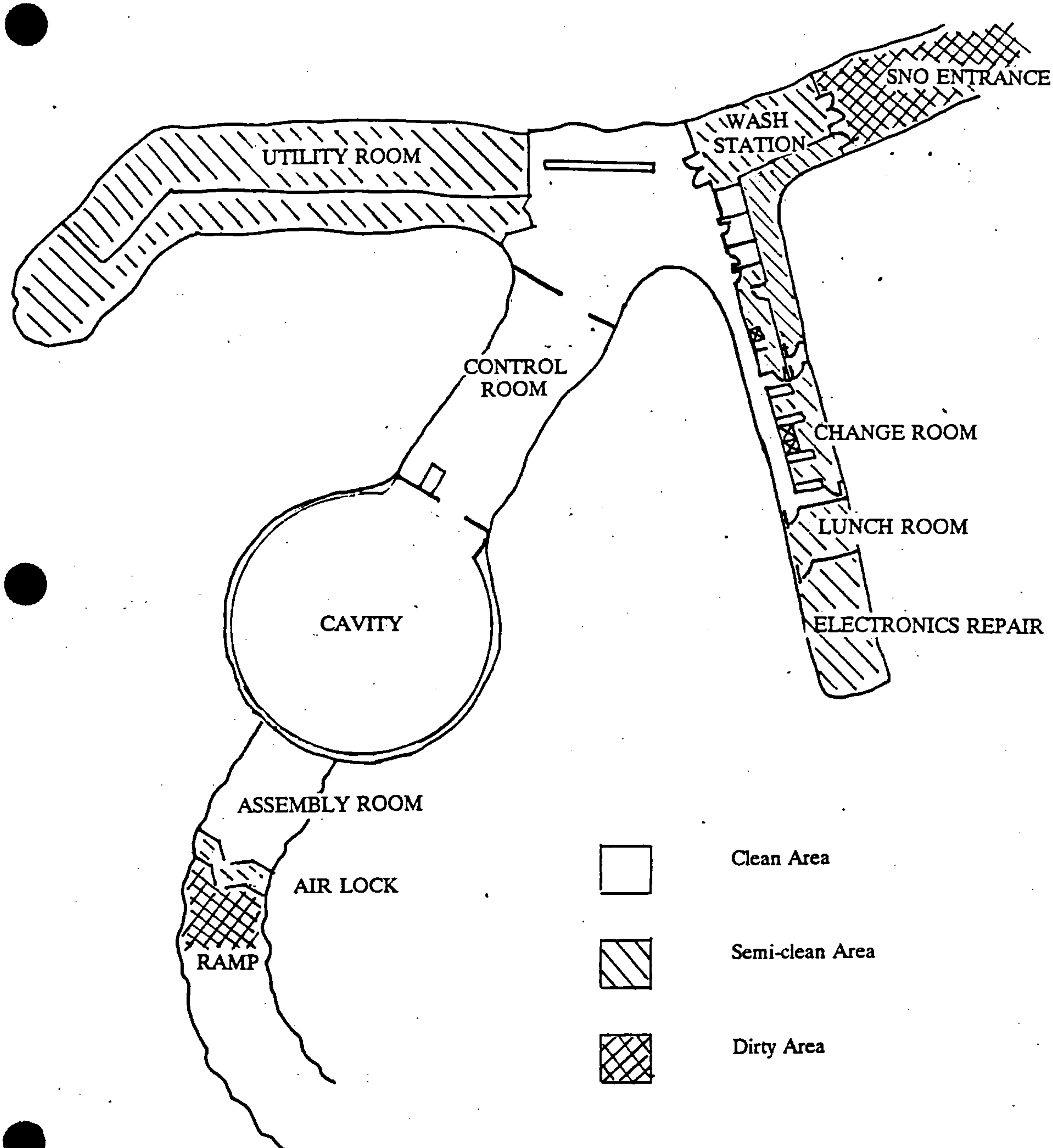
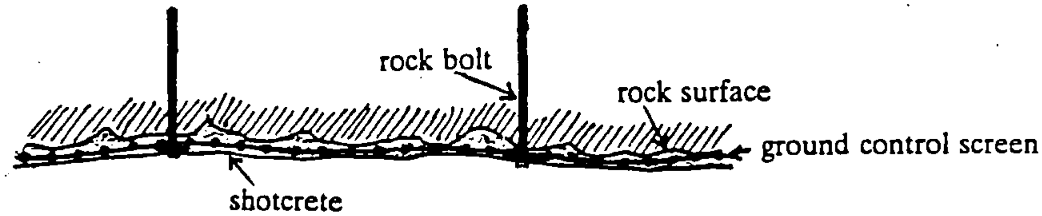
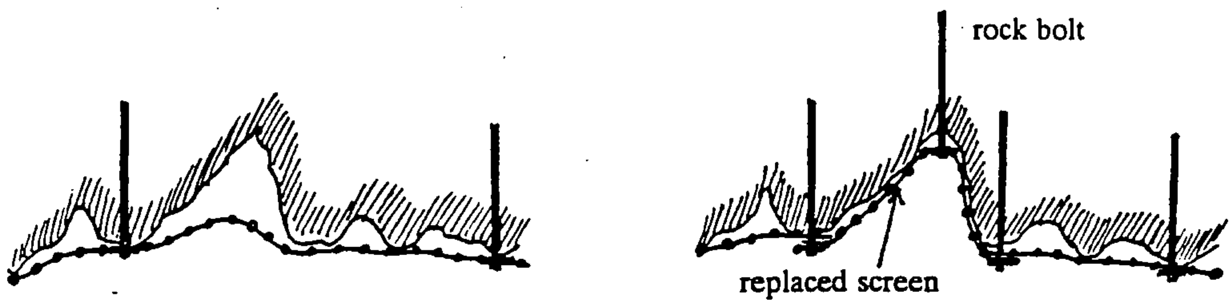


Figure 2: (a) Top view of drift excavation, ground control screen and shotcrete application.
(b) The reinstalling of ground control screen prior to shotcreting.

(a)





(b)

Figure 3: Top view of drift excavation surface showing parging and sheet installation remedial work.

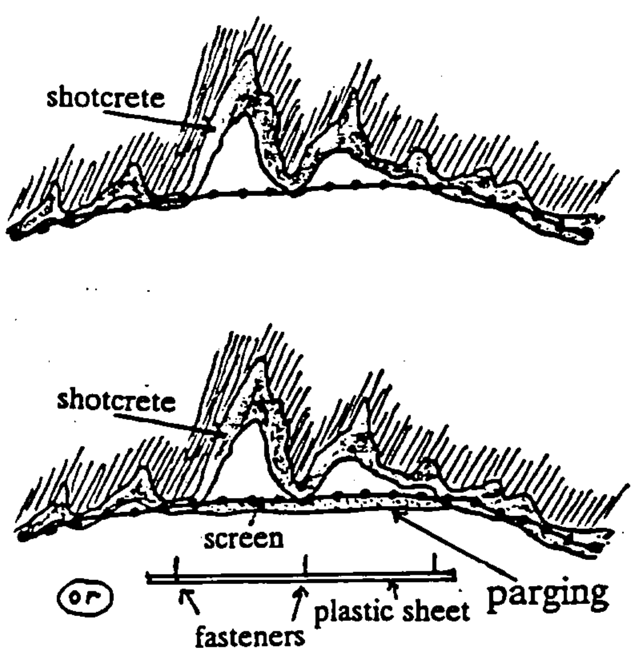
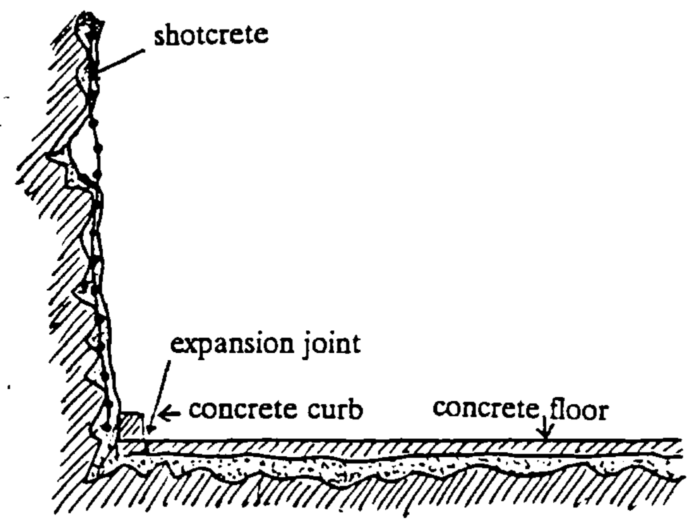


Figure 4: (a) Side view of finished shotcrete wall coating, and joint with poured concrete floor.
(b) Sketch of wash and change room areas, showing possible mezzanine layout and suspended ceiling remedial plan.

(a)



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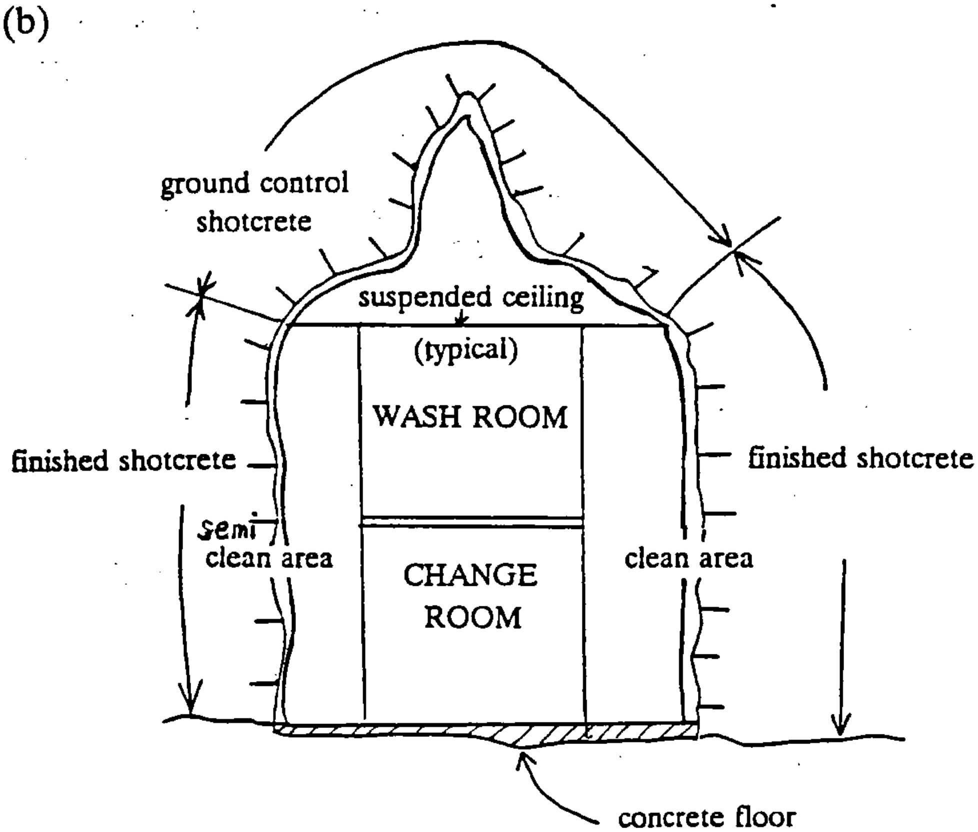

Appendix 1: Specifications for typical plastic sheet wall coverings

FABCO

WALL LINER PANELS

FIREBLOCK 20/300

Class A/Class I fiberglass panels to meet stringent building and insurance codes

When building codes and insurance underwriters demand a Class A wall liner...and health officials call for strict sanitary conditions...and building budgets require easy installation and minimum maintenance, there is a single, simple answer: Lascoboard Fireblock 20/300.

Fireblock 20/300 meets the flamespread and smoke rating* requirements for Class 1 interior finish under all major building codes (ASTM E 84, UL 723); Class A under NFPA No. 101.

But that's not all: Lascoboard also provides a wall surface that stands up to daily cleaning by detergents and steam. It won't chip or flake, dent or abrade and never needs painting. What's more, Lascoboard, properly fastened to flush wall surfaces, needs no adhesives or mastics and avoids bumps or bubbles.

Engineered for Sanitary Wall Lining

Fireblock 20/300 is not just another fire-rated panel. It has been engineered by the leading innovator in fiberglass building products to meet all requirements of sanitary wall lining:

Engineered...for easy cleaning with detergents or steam.
Engineered...to lay flat and stay flat on flush walls.
Engineered...in .090" thickness to resist impact and avoid "oil canning".
Engineered...for direct fastening. No adhesives or mastics required or recommended in field application.
Engineered...with carefully selected white pigments to avoid "pink blush".
Engineered...to resist impact, abrasion, stains and mildew.

Good Looking Performance

In addition to superior performance, Lascoboard panels create attractive surroundings for employees and customers. Choose the surface that meets your needs:

New Satin Finish - A glare free, matte surface that provides a soothing background in brightly-lit environments.

Super Smooth Finish - Maximum ease of cleaning where frequent wash-downs are required to maintain sanitary standards and appearance.

Pebbled Finish - The traditional wall liner surface for easy maintenance and the sparkling look of cleanliness.

Choice of Colors - In addition to Sanitary White, Lascoboards can be supplied in your choice of colors to match or complement a particular color scheme.

Best Choice for Any Wall

- **Food processing, storage and service areas.** USDA accepted.
- **Truck liners and scuff plates.**
- **Farm animal confinement housing**
- **Recreation facilities:** indoor tennis and racquetball courts, gyms, indoor swimming pools, etc.
- **Fabricated,** laminated walls for various uses. (Special bondable back surfaces available for in-line production).

Important Facts About Fire-Rated Panels

All major building codes and fire underwriters' regulations group into one single classification any wall finish materials with flamespread ratings between 0 and 25 and smoke ratings below 450. Any wall liner panel that falls within that range is considered a Class 1 (or Class A) material.

The ratings of Lascoboard Fireblock 20/300 (flamespread -10; smoke developed - 300) were derived by United States Testing Co. under ASTM E 84 procedures. (When tested by Underwriters Laboratories (UL 723), ratings were flamespread - 15; smoke developed - less than 450.). Test reports available on request.

No other brand has any greater acceptability to building or insuracnce officials on the basis of lower flamespread ratings.

*The Significance of Ratings

Flamespread ratings are obtained by laboratory testing, intended to compare the burning characteristics of various materials. The ratings do not necessarily indicate actual fire hazards. In a full-scale fire, or similar conditions, all fiberglass panels will burn. Once ignited, they may burn rapidly, and may release dense smoke. Fire safety requires proper design of facilities and fire-suppression systems, as well as precautions during construction and occupancy.

What is Lascoboard?

Lascoboard is a composite plastics panel, reinforced with fiberglass in a matrix of polyester resin with inorganic additives, designed to achieve significant physical properties for wall liner application, including resisistance to impact, abrasion and vapor transmission, as well as reduced flamespread ratings when tested in accordance with ASTM E 84 (UL 723).

Physical Properties of Fireblock 20

The high strength/weight ratio of Lascoboard panels is reflected in the following table of test results, based on average values obtained in frequent testing. While individual tests may produce higher values, the nature of small-scale testing leads Lasco to follow the dictates of prudent, responsible reporting.

Property	ASTM Test Method	Nominal Value
Thickness	--	to specification
Barcol Hardness	D2583	50
*Impact Strength, IZOD	D256	4 ft lb/in
Bearing Strength	D953	14,000 psi
Fexural Strength	D790	9,000 psi
Flexural Modulus	D970	$.8 \times 120^6$ psi
Tensile Strength	D638	5,000 psi
Coefficient of Lineal Thermal Expansion	D6967	24×10^{-6} in/in/°F
Water Absorption	D570	.5%
*Thermal Conductivity (K-factor)	C177	1.2 BTU/in/hr/ft^2/°F
Flamespread	E84	20
Smoke Developed	E84	300
Ignition Temperature	D1929	
Self		>650°F
Flash		900°F
Flammability	D635	ATB <5 sec AEB 0.5 in

Values vary with thickness; values shown for .90".

The information contained in this publication is provided as a preliminary guide for designers. Interpretation and application are functions of the user.

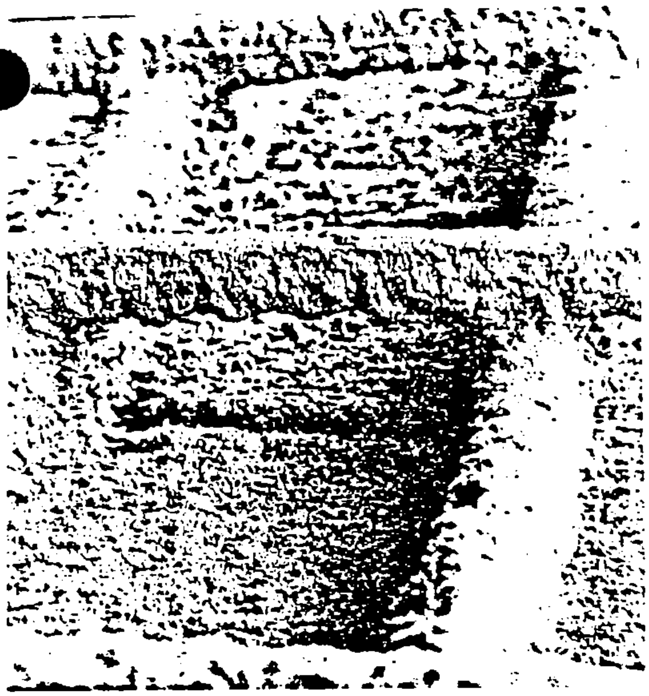

Fig. 8.11—Overspray on reinforcing bars at the top of a band of shotcrete. If the overspray is permitted to harden, and remain on the bars during the next application of shotcrete, it will be impossible to fill behind the bars with good shotcrete. Large hollows will remain within the wall, pro- oting cracking and moisture penetration.

The figures in Table 8.1 show approximate rebound losses for dry- and wet-mix shotcrete. They may be higher or lower depending on the expertise of the individual nozzleman.

8.5.11 *Suspension of work*—Gunning should be suspended under the following inclement weather conditions:

(1) High winds preventing proper application procedures

(2) Temperatures approach freezing and the work cannot be protected

(3) Rain causing washouts or sloughing of the fresh shotcrete

TABLE 8.1—REBOUND LOSSES

Surface	Percent of rebound	
	Dry mix	Wet mix
Floor or slabs	5–15	0–5
Sloping and vertical walls	15–25	5–10
Overhead work	25–50	10–20

8.6—Finishing

In dry-mix shotcrete the natural or gun finish is the ideal finish from both a structural and durability standpoint. Further finishing may disturb the section, creating cracks, reducing internal cohesion, and breaking bond between the shotcrete and the reinforcement or shotcrete and the underlying material. Additional finishing may not be easily accomplished because dry-mix shotcrete is usually stiff and difficult to work under normal trowel manipulation. Unlike concrete, shotcrete has little excess water to provide the particle lubrication necessary to promote effective finishing.

Wet-mix shotcrete follows the same procedures as dry-mix except that finishing may be somewhat easier due to the higher consistency.

8.6.1 *Natural finishes*—The gun finish is the natural finish left by the nozzle after the shotcrete is brought to approximate line and grade. It leaves a textured, uneven surface which is suitable for many applications. In those cases where better alignment, appearance, or smoothness are required, the shotcrete is placed a fraction beyond the guide strips, ground wires, or forms. It is allowed to stiffen to the point where the surface will not pull or crack when screeded with a rod or trowel. Excess material is then trimmed, sliced or scraped to true line and grade (Fig. 8.12). The guide strips or ground wires are then removed and impressions they leave are removed by floating. The finish left in this condition is a natural rod finish. If this finish is broomed, it is called a natural broom finish. It may also be a float or steel trowel finish as described in Section 8.6.3.

8.6.2 *Flash and finish coats*—Where a finer finish or better appearance is desired a "flash" coat may be used. The flash coat is a thin surface coating up to ¼ in. (6 mm) thick containing fine No. 1 gradation sand, passed through a No. 4 sieve eliminating the larger particles that complicate finishing. The mixture is applied fairly wet at nozzle distance of 8 to 12 ft (2.4 to 3.6 m) at low volume and high pressure, giving a finely textured, stucco-like finish. The flash coat is applied to the shotcrete surface which was left about ¼ in. (6 mm) low either immediately after screeding or at a later time and is rodded as described in Section 8.6.1.

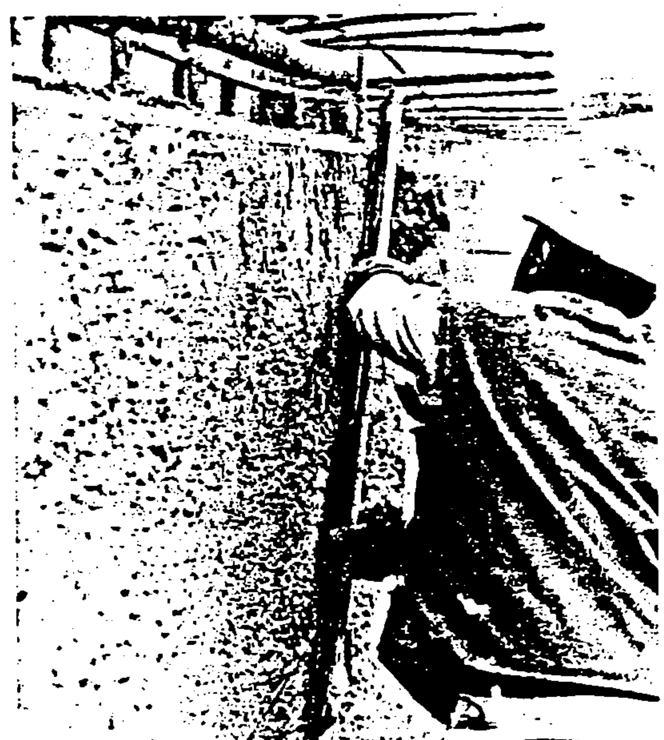

Fig. 8.12—Screeding excess or overgunned shotcrete leaving rough textured finish

For thick walls, an alternate approach is to apply a "finish" coat which can provide greater uniformity in texture and appearance. The basic shotcrete application is brought to within ¼ to 1 in. (6 to 25 mm) of the final grade. A thin surface or finish coat, ¼ to 1 in. (6 to 25 mm) may be applied immediately after screeding or at a later time. If the finish coat is applied later the base shotcrete must be left properly scarified or broomed. Just prior to the application of the final or finish coat the receiving surface is washed down with an air-water blast. The finish coat may utilize sand similar to that used in the base coat.

8.6.3 *Final finishes*—If desired, the flash or finish coat may be finished in one of the following ways.

8.6.3.1 *Wood float.* This procedure leaves a uniform but granular texture. It is also used as a preliminary finish for other surface treatments.

8.6.3.2 *Rubber float.* A sponge rubber float is applied directly to the flash coat or wood float finish leaving a somewhat finer finish.

8.6.3.3 *Brush finish.* A fine hairbrush float finish giving a finely textured, sandy finish.

8.6.3.4 *Steel trowel.* A steel trowel finish is applied to a wood float finish leaving a smooth, hard finish. This finish is difficult to achieve requiring considerable effort. It is not recommended. Most shotcrete finishes are more coarsely textured than their concrete counterparts (Figs. 8.13a and 8.13b).

8.7—Curing

Shotcrete, like concrete, must be properly cured so that its potential strength and durability are fully developed. This is particularly true for the thin sections, textured surfaces, and low water-cement ratios associated with shotcrete. The best method for curing is keeping the shotcrete wet continuously for 7 days while maintaining a temperature over 40 F (5 C).

Curing compounds are satisfactory for curing if drying conditions are not severe and where no additional shotcrete or paint is to be applied and the appearance is acceptable. Where the surface has a natural gun or flash finish, the liquid membrane curing compound should be applied heavier than on surfaces with a finer finish. A rate of 100 ft²/gal. (2.4 m²/L) should be adequate. Natural curing may be allowed if the relative humidity is at or above 85 percent. More detailed information on curing may be found in ACI 308 and ACI 506.2.

Rapid drying of shotcrete at the end of the curing period should be avoided.

8.8—Hot weather shotcreting

The problems associated with mixing and placing shotcrete during hot weather are more acute with wet-mix than with dry-mix shotcrete. With dry-mix shotcrete it is desirable that the time from mixing to gunning a mix does not exceed 15 min; otherwise, undesirable decreases in strength due to prehydration can occur. With wet-mix shotcrete the undesirable effects are similar to ordinary pumped concrete.

The problems include increased water demand, increased rate of slump loss, increased rate of set and difficulty in regulating entrained air content. Procedures must be developed to handle these problems so as to insure a satisfactory shotcrete installation.

Once the shotcrete is in place, both methods follow similar finishing and curing procedures. Screeding and finishing operations should proceed as rapidly as the shotcrete conditions allow. Curing should be started promptly after finishing is completed. Ideally, the temperature of the shotcrete should be maintained between 50 and 100 F (10 and 38 C) during all phases of the installation procedure. ACI 305 should be referred to for more detailed information.

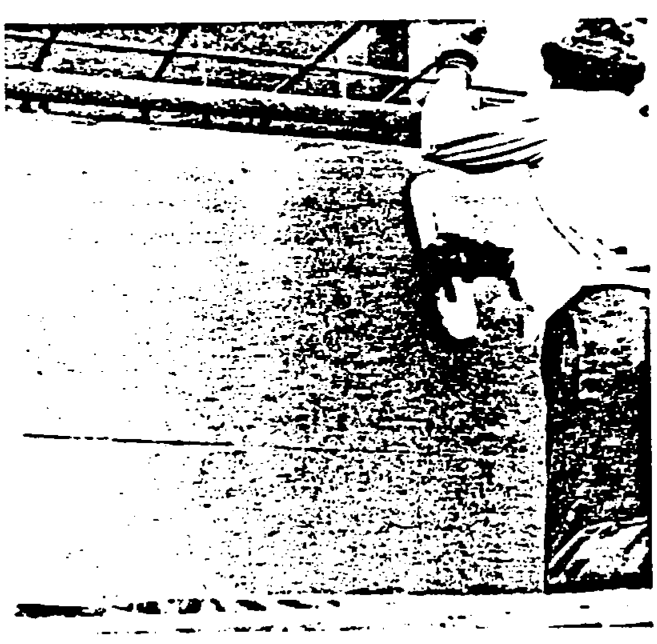

Fig. 8.13a—Applying a steel trowel finish to freshly gunned shotcrete surface

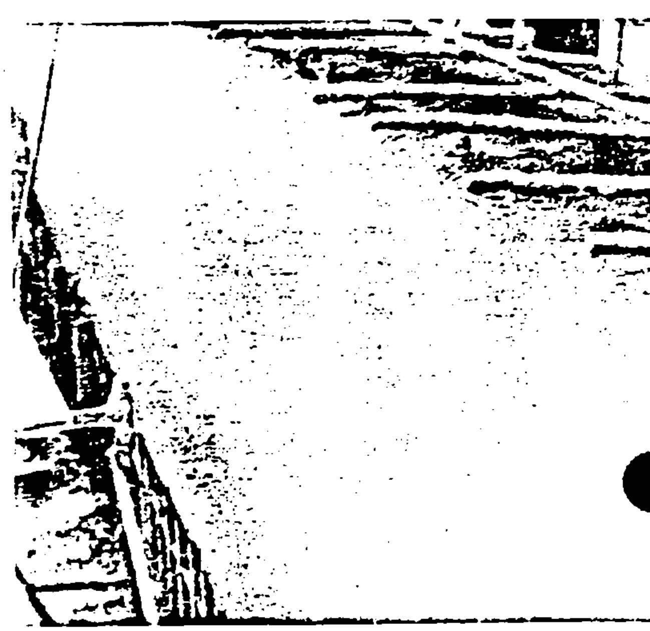

Fig. 8.13b—Final finish appearance

Appendix 3: Specifications sheets for high build epoxy coating

BMS mfg inc

OXYGUARD 300

Chemical Resistant High Build Epoxy Coating.

Description

Solventless, room-temperature and rapid curing 2-component epoxy-resin based coating. It provides a high gloss, tile-like finish which is tough and sanitary, and a compromise between ease of maintenance and non-skid characteristics.

Uses

Primarily designed to topcoat jointless floor toppings to provide a waterproof, chemically resistant barrier. Applied as a coating with a broadcast aggregates to protect against corrosion, wear and skidproof steel, wood or concrete.

Characteristics

Application	: brush, short-nap roller, squeegee or airless spray. heavy coat, more than 1.5 mm (1/16") of thickness should immediately be deaerated with a piked roller (wear spiked shoes).
Color	: light and medium grey, tile red, and special colors are available on request
Cure time	: 8 to 12 hours for light traffic at room temperature
Dilution	: 5 to 10% by volume for brush and roller 10 to 15% by volume for spray using OXYSOLVE 950
Mixing	: mix thoroughly for 3 to 5 minutes using a mechanical mixer
Mixing ratio	: 1 to 1 by volume
Odor	: very low, and none when cured
Safety	: avoid skin contact, provide good ventilation and protective gloves, and wash hands with mild soap and water
Storage	: at room temperature
Surface preparation	: all surfaces to be coated must be sound and free from contaminants
Toxicity	: safe to handle, non-toxic when cured, ASBESTOS-FREE
Working time	: 15 to 25 minutes without dilution and 35 to 45 minutes with dilution at room temperature

Properties

Compressive strength	(ASTM D-695)	50.0 MPa (7300 psi)
Tensile strength	(ASTM D-638)	31.0 MPa (4500 psi)
Ultimate elongation	(ASTM D-638)	3.0 % or more
Water absorption	(ASTM D-570)	1.5 % or less

Limitations

Application of OXYGUARD 300 is not recommended when ambient and/or substrate temperature is below 5°C (35°F).

155 TORYORK DR., UNIT 10, WESTON, ONT. M9L 1X9 (416) 740-8914

Appendix 4. Specification sheet for typical polyurethane foam filler.

ABISKO Mfg./Inc. ENER Foam

Insulating Foam Air Barrier Sealant

1. PRODUCT NAME

One Component Polyurethane Foam, Insulating Sealant: Enerfoam®

2. MANUFACTURER

Abisko Manufacturing Inc.
4 Buckingham Street
Toronto ON M8Y 2W1
416-259-3264
Fax:416-259-5242

3. PRODUCT DESCRIPTION

Enerfoam® is a polymeric insulating foam sealant. Applied by NBS dispensing gun as a bead of up to 75mm (3") diameter to fill and seal gaps, cracks and holes within or between most types of construction materials, including air barrier components.

- It cures to a semi-rigid seal that allows for normal movement between the building components.
- It bonds to most surfaces with a bond-strength stronger than the foam itself.
- It is a post-expanding foam that fills irregular voids completely. It does not shrink after installation.
- It is compatible with most normal construction materials, including other plastic insulations.

It forms an airtight seal that withstands normal wind and mechanically induced air pressures.
It possesses excellent insulating characteristics: RSI 1 (R5.7) per inch thickness.

Basic use: General: To seal gaps, cracks, holes, etc., to prevent passage of air, dust, moisture, noise, odour, insects, rodents and birds.

Air Barrier applications: To seal between elements in the building envelope; such as at windows, entrances, structural elements, wall/roof intersections, and penetrations (electric outlets, wall ties, ducts, etc.) In retrofit work: to repair non-continuous areas in air barriers, and to reduce energy costs.

Noise Control applications: To seal gaps, cracks, holes and flanking paths in sound-rated partitions and floor/ceiling assemblies, to prevent the passage of airborne sound between adjacent rooms.

Miscellaneous applications: To seal gaps, crack penetrations, etc., to prevent spread of smoke, toxic gases, odours, insects, water leaks and flooding, etc., to other areas of the building. Wire mesh embedded within Enerfoam® forms a barrier against rodents, birds and other pests.

Limitations: Enerfoam® is not recommended for:

- exterior areas continuously exposed to ultra-violet rays, unless suitably protected
- long-term immersion in water
- long-term exposure to temperatures above +120° C (250° F), or to open flame
- use as a vapour retarder as defined in CAN/CGSB-51.33-M80

Caution: Do not use Enerfoam® where building codes require use of UL classified firestop systems complying with ULC/CAN4-S115-M85 for sealing building services and other openings which penetrate fire separations or fire rated assemblies.

Composition of Materials: Enerfoam® is a single component polyurethane foam insulating sealant consisting of polymeric isocyanate/polyol with catalyst and chlorodifluoromethane. It is ozone-friendly (no CFC's) and does not contain urea formaldehyde, or have any food value for insects, rodents, etc. Being a single component material, Enerfoam® does not require any mixing or proportioning on the job.

Texture: Cures with a smooth, tough skin and a cellular inner-core.

Colour: Cured foam is white in colour and will turn creamy-yellow with age, if not suitably protected.

4. TECHNICAL DATA

(Typical properties at +20° C (70° F) and 50% R.H.

Density	1.7 lbs/cu.ft.
Elongation at break	20 + 5%
Shear strength	8 psi
Flexural strength	15 psi
Compressive strength at 10% compression	14 psi
Water absorption	0.3%
Thermal resistance R/factor/inch	5.7 (RSI=1)
Thermal conductivity KCAL/M² /HR/C° /CM	0.027
Fire resistance	Contains flame retardant
Initial expansion	APPR 25%
Foam appearance	Fine homogeneous cell structure
Yield from 1 Kg.	Approx 1 cu. ft.
Shelf-life	12 months
Tack free time	6-7 minutes
Cure time	Approx 1 hr. at 20° C (70° F)

5. INSTALLATION

Preparatory Work: Surfaces should be free of dust, oil, grease, frost and loose debris which may impair bond. Dampness will not impair bond.
For maximum yield, temperature of Enerfoam® should be 20° C (70° F). Minimum application temperature is -5° C (23° F). Colder temperatures lengthen curing time but will not affect the Enerfoam® properties when fully cured. Where adjacent surfaces are to be left exposed, provide suitable protective masking during installation.

Precautions: Wear protective gloves, clothing and safety glasses. Keep sealant out of reach of children. Provide adequate ventilation.
Application: Apply Enerfoam® in accordance with instructions on the aerosol container. Use NBS dispensing gun equipment from Abisko Manufacturing Inc.
Fill gaps, cracks and holes with the sealant making allowance for post-expansion of the foam. Multi-layer application may be necessary with successive layers being allowed to cure before next layer is applied.
Curing may be accelerated in deep cavities by slight moistening of the surrounding surface prior to dispensing of sealant.
Avoid insertion into small tubular sections composed of non-porous materials. (Metal, aluminum, etc.)
If concerned about bowing of lightweight frames, provide temporary bracing before applying foam sealant.
Cut back excess sealant after curing, to be flush with surrounding surfaces or recess to sufficient depth for facing by finishing caulking if necessary.
While curing, insulating foam sealant may be tooled when tack-free. It will contract within itself because of its cellular nature. Large beads may be tooled into much smaller gaps.

Finishes: Enerfoam® sealant may be left exposed and painted if desired, or covered over with interior finishes such as plaster, drywall, panelling, trim, grout, etc.

Building Codes: Enerfoam® complies with the: National Building Code of Canada 1980, Section 9.26.2.1 and Residential Standards 1980, Section 26B.