aloeterra

LTU SOLAR DECATHLON 2007

Lawrence Technological University
Southfield, Michigan

Solar Decathlon 2007
Construction Specifications

- For -

National Renewable Energy Laboratory (NREL)
U.S. Department of Energy (DOE)

August 07, 2007

TABLE OF CONTENTS

Structural Calculations (progress report)
Summary of Changes since July, 2007
Water Inventory
Recycling Estimate
Summary of Unlisted Electrical Components
Material Safety & Data sheets will be at the end of each product's section (where required)

CSI Section	Section Title
Div. 01	General Requirements
O1 20 00	Price & Payment Procedures
O1 30 00	Administrative Requirements
01 35 43	Environmental Procedures
O1 40 00	Quality Requirements
O1 50 00	Temporary Facilities & Controls
O1 60 00	Product Requirements
01 74 19	Construction Waste Management & Disposal
Div. 02	Existing Conditions
02 05 19	Geosynthetics for Existing Conditions
Div. 03 through 04 - NOT USED FOR COMPETITION	
Div. 05	Metals
O5 10 00	Structural Metal Framing
O5 40 00	Cold-Formed Metal Framing
Div. 06	Wood & Plastics
O6 05 73	Wood Treatment
O6 10 00	Rough Carpentry
06 12 16	Stressed Skin Panels
06 20 23	Interior Finish Carpentry
06 50 00	Structural Plastics
Div. 07	Thermal & Moisture Protection
07 20 00	Thermal Protection
07 27 13	Modified Bituminous Sheet Air Barriers
07 41 00	Metal roof and Wall Panels
O7 54 00	Thermoplastic Membrane Roofing
07 62 00	Sheet Metal Flashing and Trim
07 65 00	Flexible Flashing
O7 92 00	Joint Sealants
Div. 08	Doors & Windows
O8 16 13	Fiberglass Doors
08 54 13	Fiberglass Windows
08 60 00	Roof Windows & Skylights
08 71 00	Door Hardware
08 84 13	Decorative Plastic Glazing
08 88 00	Special Function Glazing

CSI Section	Section Title
Div. 09	Finishes
09 29 00	Gypsum Board
09 30 00	Tiling
09 64 00	Wood Flooring
09 77 00	Special Wall Surfacing
09 91 00	Painting
09 93 00	Staining and Transparent Finishing
Div. 10	Specialties
10 71 00	Exterior Protection
Div. 11	Equipment
11 28 13	Computers
11 31 00	Residential Appliances
11 82 23	Recycling Equipment
Div. 12	Furnishings
12 00 00	Furnishings
12 20 00	Window Treatments
12 58 26	Entertainment Centers
12 93 00	Site Furnishings
Div. 13 through 21- NOT USED FOR COMPETITION	
Div. 22	Plumbing
22 00 00	Plumbing
22 11 00	Facility Water Distribution
22 12 00	Facility Water Storage Tanks
22 42 10	Plumbing fixtures
Div. 23	Heating, Ventilating, and Air-conditioning (HVAC)
23 00 00	Heating, Ventilating, and Air-conditioning (HVAC)
23 56 00	Solar Energy Heating Equipment
23 83 00	Radiant Heating Units
Div. 25	NOT USED FOR COMPETITION
Div. 26	Electrical
26 00 00	Electrical - lighting
26 09 00	Instrumentation and Control for Electrical Systems
26 20 00	Low-Voltage Electrical Transmission
26 28 16	Enclosed Switches and Circuit Breakers
26 31 00	Photovoltaic Collectors
26 33 13	Batteries
Div. 27	Communications
27 20 00	Data Communications
Div. 28 - NOT USED FOR COMPETITION	
Div. 31	Earthwork
31 68 00	Foundation Anchors

CSI Section	Section Title
Div. 32	Exterior Improvements
32 93 00	Plants
Div. 33	Utilities
33 82 33	Coaxial Communications Distribution Cabling
Div. 34	Transportation
34 77 00	Transportation Equipment

Div. 35 through 43 - NOT USED FOR COMPETITION

Div. 44	Transportation
44 40 00	Water Treatment Equipment

Div. 45 through 48 - NOT USED FOR COMPETITION

STRUCTURAL DESIGN CALCULATIONS

Solar Decathlon 2007
Lawrence Technological University

STATE OF MICHIGAN
DAVID S. DAYTON, III
ENGINEER
No. 44269
LICENSED PROFESSIONAL ENGINEER

5/22/07

David S. Dayton, P.E.
Engineering Services
6306 145th Ave.
Holland, MI 49423
616-566-3683
616-748-0995 fax

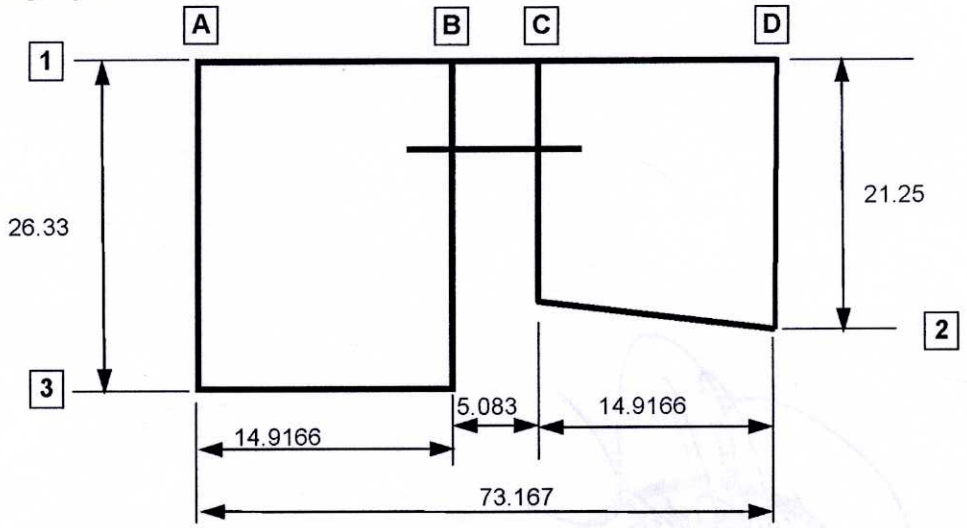
David S. Dayton, P.E.
Engineering Services
6306 145th Ave.
Holland, MI 49423
616-566-3683
616-748-0995 fax

Job Number: 07-110
Client Job Number:
Date: 5/15/2007

Building Code:	International Building Code / Michigan Building Code		
Roof Snow Load:	30 psf		
Roof Dead Load:	15 psf		
Floor Live Load:	50 psf		
Floor Dead Load:	15 psf		
Wind Speed:	90 mph	Exposure C	(ASCE 7 Load Requirements)

Primary Framing System: Bearing Wall
Lateral Force Resistance System: Shearwall / Flexible Diaphragm

Building Layout



One Story with Elevated Center Area
Story height 10 ft Roof mean Ht = 15 ft
90 mph Wind Speed, Exposure C

Windward Walls =	12.07 psf
Leeward Walls =	7.53 psf
Windward Roof Uplift =	22.4 psf

Bearing walls are to be as follows:
Wall Panels: 9.25" Core SIP walls as manufactured by R-Control based on ESR - 1006
Roof Panels: 9.25" Core SIP walls as manufactured by R-Control based on ESR - 1006

Per the ESR-1006 Allowable loads for the SIP panela are as follows:

	9.25"	
Allowable Axial Load (plf):	3500	(based on 10' panel & 5.5" Core)
Allowable Transverse Load (psf):	64	(based on Detail 102g)
Allowable Transverse Load (psf):	84	(based on Detail 102h)
Allowable Shear Load (plf):	335	

David S. Dayton, P.E.
Engineering Services
6306 145th Ave.
Holland, MI 49423
616-566-3683
616-748-0995 fax

Job Number: 07-110
Client Job Number: 0

Date: 5/15/2007

Roof Panel Design

Max Roof Panel Span = 14 ft

Alllowable Transverse Load per ESR 1006 Table 6 = 84 psf at L/240
73 psf at L/360

Max Roof Snow Load = 30 psf

Max Gross Uplift Load = 22.4 psf

Dead Load = 15 psf

Max Gravity Load = 45 psf

Max Uplift Load = 7.4 psf

Calculate Axial Load from Wind on Walls

Assume 10' walls x 48" panel

20 sq ft of area x (12.07 + 7.53) = 392 lbs

Check Unity Equation

(Design Axial/Allowable Axial) + (Design Transverse/Allowable Transverse) < 1.0

(392 / 3500) + (45 / 73) = 0.112 + 0.616 = 0.728 < 1.0 OK

Wall Panel Design

Max Axial on Walls = (45x7) = 315 plf

Max Transverse Wind Load = 12.07 psf

Check Unity Equation

(Design Axial/Allowable Axial) + (Design Transverse/Allowable Transverse) < 1.0

(315 / 3500) + (12 / 64) = 0.09 + 0.1875 = 0.278 < 1.0 OK

David S. Dayton, P.E.
Engineering Services
6306 145th Ave.
Holland, MI 49423
616-566-3683
616-748-0995 fax

Job Number: 07-110
Client Job Number: 0

Date: 5/15/2007

Floor Panel Design

Max Panel Span = 14.9166 ft

Alllowable Transverse Load per ESR 1006 Table 6 = 84 psf at L/240
73 psf at L/360

Max Live Load = 50 psf

Dead Load = 15 psf

Max Gravity Load = 65 psf

Calculate Axial Load from Wind on Walls

Assume 10' walls x 48" panel

20 sq ft of area x (12.07 + 7.53) = 392 lbs

Check Unity Equation

(Design Axial/Allowable Axial) + (Design Transverse/Allowable Transverse) < 1.0

(392 / 3500) + (65 / 73) = 0.112 + 0.89 = 1.00 < or = 1.0 OK

David S. Dayton, P.E.
Engineering Services
6306 145th Ave.
Holland, MI 49423
616-566-3683
616-748-0995 fax

Check Shear Loads on Wall Sections

Max wall height = 9 ft H/W ratio = 2.0

Min wall length to count as shear wall is then 4.5'

Wall shear on wall # 4 from Team drawings

Loading form wind on wall 3/2 (assume Pressure & Suction)

14 ft long 9 ft tall

Trib Area to Wall 3 = 31.5 sq ft

Total Wind Load on wall area = 19.6 psf

Shear load on Wall 3 = 617 lbs

Wall length usable for shear load = 4.5 ft

Actual load per foot = 137 plf < Allowable load of 335 plf OK

Baased on these calulaions all of the other walls meet or exceed the design shown here.

ICC Evaluation Service, Inc.
www.icc-es.org

Business/Regional Office ■ 5360 Workman Mill Road, Whittier, California 90601 ■ (562) 699-0543
Regional Office ■ 900 Montclair Road, Suite A, Birmingham, Alabama 35213 ■ (205) 599-9800
Regional Office ■ 4051 West Flossmoor Road, Country Club Hills, Illinois 60478 ■ (708) 799-2305

DIVISION:06—WOOD AND PLASTICS
Section:06120—Structural Panels

DIVISION:07—THERMAL AND MOISTURE PROTECTION
Section:07210—Building Insulation
Section:07220—Roof and Deck Insulation

REPORT HOLDER:

AFM CORPORATION
211 RIVER RIDGE CIRCLE, #102
BURNSVILLE, MINNESOTA 55337
www.r-control.com
afm@r-control.com

EVALUATION SUBJECT:

R-CONTROL® EPS BOARDS, R-CONTROL® PERFORM GUARD® EPS BOARDS, R-CONTROL® STRUCTURAL INSULATED PANELS, AND R-CONTROL® FIRERESIST® STRUCTURAL INSULATED PANELS

ADDITIONAL LISTEES:

R-Control® EPS Boards, R-Control® Perform Guard® EPS Boards, R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels:

ACH FOAM TECHNOLOGIES, LLC

BIG SKY INSULATIONS, INC.

BRANCH RIVER PLASTICS, INC.

FLEXIBLE PACKAGING COMPANY

NOARK ENTERPRISES, INC.

TEAM INDUSTRIES, INC.

R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels:

CHAPMAN BUILDING SYSTEMS

R-Control® EPS Boards and R-Control® Perform Guard® EPS Boards:

KNAUF USA POLYSTYRENE INC.

PACIFIC ALLIED PRODUCTS, LTD.

POLY-FOAM INC.

THERMA FOAM, INC.

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2000 *International Building Code®* (IBC)
- 2000 *International Residential Code®* (IRC)
- 2002 *Accumulative Supplement to the International Codes™*
- BOCA® *National Building Code*/1999 (BNBC)
- 1999 *Standard Building Code©* (SBC)
- 1997 *Uniform Building Code™* (UBC)
- 1998 *International One- and Two-Family Dwelling Code®* (I1&2)

Properties evaluated:

R-Control® EPS Boards:

- Surface burning characteristics
- Thermal performance (*R*-values)
- Attic and crawl space installation

R-Control® Perform Guard® EPS Boards:

- Surface burning characteristics
- Termite resistance
- Thermal performance (*R*-values)

R-Control® Structural Insulated Panels:

- Structural
- Fire-resistance-rated assemblies

R-Control® FireResist® Structural Insulated Panel:

- Structural
- Fire-resistance-rated assemblies
- Thermal barrier

2.0 USES

2.1 R-Control® EPS Boards:

R-Control® EPS boards are used as nonstructural insulation in buildings of any construction, and in approved single-ply membrane roof-covering assemblies.

2.2 R-Control® Perform Guard® EPS Boards:

R-Control® Perform Guard® EPS boards are used as the expanded polystyrene (EPS) core material for R-Control® Structural Insulated Panels and R-Control FireResist® Structural Insulated Panels, and as nonstructural insulation in buildings of any construction. The boards are termite-resistant and are permitted to be installed below grade in accordance with this report.

***Revised November 2006**

ES REPORTS™ *are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, Inc., express or implied, as to any finding or other matter in this report, or as to any product covered by the report.*

ANSI Accredited Program PRODUCT CERTIFICATION

Copyright © 2006

2.3 R-Control® Structural Insulated Panels:

R-Control® Structural Insulated Panels are used as structural insulated wall, floor and roof panels in buildings of any construction.

2.4 R-Control® FireResist® Structural Insulated Panels:

R-Control® FireResist® Structural Insulated Panels are used as structural insulated wall, floor, and roof panels in buildings of any construction without a thermal barrier.

3.0 DESCRIPTION

3.1 R-Control® EPS Boards:

R-Control® EPS boards are molded, closed-cell, expanded polystyrene boards. The boards are manufactured at minimum densities of 0.90, 1.15, 1.35 and 1.80 pcf (14.4,18.4, 21.6, 28.8 kg/m^3). The designations for each density are Type I, Type VIII, Type II, and Type IX. The products comply with ASTM C 578. See Table 1.

R-Control® EPS boards with a maximum thickness of 6 inches (152.4 mm) have a flame-spread index not exceeding 25 and a smoke-development index not exceeding 450 when tested in accordance with ASTM E 84.

3.2 R-Control® Perform Guard® EPS Boards:

R-Control® Perform Guard EPS boards are molded, closed-cell, expanded polystyrene boards treated for termite resistance. The boards are manufactured at a minimum density of 0.90 pcf (14.4 kg/m^3). The products comply with ASTM C 578. The boards include a borate additive in the foam to provide termite resistance. The boards are used as nonstructural insulating sheathing and foundation insulation (as described in Section 4. 3), and as core material for R-Control® Structural Insulated Panels (in accordance with Section 3.3 of this report) and R-Control FireResist® Structural Insulated Panels (in accordance with Section 3.4).

R-Control® Perform Guard EPS boards with a maximum thickness of 6 inches (152.4 mm) have a flame-spread index not exceeding 25 and a smoke-development index not exceeding 450 when tested in accordance with ASTM E 84.

3.3 R-Control® Structural Insulated Panels:

R-Control® Structural Insulated Panels are factory-assembled, engineered-wood-faced, structural insulated panels with EPS foam plastic as the core material. The panels are intended for use as load-bearing or nonload-bearing wall, roof, and floor components. The R-Control® Structural Insulated Panels consist of two layers of minimum $^7/_{16}$-inch-thick (11.1 mm) oriented strand board (OSB) facings complying with DOC PS2-92. The EPS core material is minimum 0.95 pcf density (15.22 kg/m^3), flame-modified polystyrene foam plastic insulation board, identified as R-Control® Perform Guard® EPS. Panel core thicknesses range from $3^1/_2$ through $11^1/_4$ inches (88.9 mm to 285.8 mm). The facing is bonded to the EPS core with high-quality structural-grade adhesive and cured under factory-controlled conditions. The panels vary in width from 4 feet to 8 feet (1.2 m to 2.4 m) and in length from 8 feet to 24 feet (2.4 m to 7.3 m).

3.4 R-Control® FireResist® Structural Insulated Panels:

R-Control® FireResist® Structural Insulated Panels are identical to the R-Control® Structural Insulated Panels described in Section 3.3, except that one face of the OSB board has a minimum 0.060-inch thickness of fiber-reinforced inorganic coating applied to the OSB to provide a 15-minute thermal barrier.

4.0 INSTALLATION

4.1 General:

R-Control® EPS boards, R-Control® Perform Guard® EPS boards, R-Control® Structural Insulated Panels, and R-Control® FireResist® Structural Insulated Panels are installed in accordance with the manufacturer's published installation instructions and this evaluation report.

The manufacturer's published installation instructions and this report shall be strictly adhered to, and a copy of the instructions shall be available at all times on the jobsite during installation. The installation instructions within this report govern if there are any conflicts between the manufacturer's instructions and this report.

4.2 R-Control® EPS Boards:

4.2.1 General: R-Control® EPS boards shall be attached to supports in a manner which will hold the insulation securely in place.

The boards are permitted to be used as exterior perimeter insulation around concrete slab edges, foundation walls, and crawl spaces, and under flat concrete slab on grade construction. The boards are also permitted to be used as interior wall sheathing and general insulation; as roof insulation when listed as a component of a roof-covering assembly in a current ICC-ES evaluation report; in any EIFS system when listed as a component of the system in a current ICC-ES evaluation report; and in other proprietary wall systems recognized in a current evaluation report.

The EPS boards shall not be used structurally to resist transverse, vertical or in-plane loads. The boards shall not be used as exterior stud wall bracing. Wall bracing shall be provided in accordance with the applicable code.

The EPS boards shall not be used as a nailing base for exterior siding materials. All nailing shall be made through the maximum $1^1/_2$-inch-thick (38 mm) sheathing into the wall studs.

In areas where the probability of termite infestation is very heavy and when foam plastic insulation is used with wood construction, the foam plastic shall be installed in accordance with Section R324.4 of the IRC, or Section 2603.3 of the SBC, or Section 323.4 of the I1&2.

4.2.2 Special Use—Attics and Crawl Spaces: R-Control® EPS boards with a 2-inch (50.8 mm) maximum thickness and a 2.0 pcf (32.04 kg/m^3) nominal density, and a maximum thickness of 4 inches (102 mm) and a nominal density of 1 pcf (16.02 kg/m^3), are permitted to be installed exposed in attics and crawl spaces without the ignition protective coverings listed in Section 2603.4.1.6 of the IBC, Section R318.3 of the IRC, Section 2603.5.1.6 of the SBC, Section 2603.4.1.4 of the BNBC, Section 2602.4 (Exception 4) of the UBC, and Section 317.3 of the I1&2, under the following conditions:

- Entry to the attic or crawl space is limited to service ofutilities.
- There are no interconnected attic or crawl space areas.
- Air in the attic or crawl space is not circulated to other parts of the building.
- Ventilation of the attic or crawl space is provided in accordance with the applicable code, and combustion air is provided in accordance with the applicable mechanical code.

4.3 R-Control® Perform Guard® EPS:

4.3.1 General: R-Control® Perform Guard® EPS boards shall be attached to supports in a manner which will hold the insulation securely in place. The boards shall be covered on the interior of the building by an approved 15-minute thermal barrier.

The boards are permitted to be used as exterior perimeter insulation around concrete slab edges, foundations walls, and crawl spaces, and under flat concrete slab on grade construction. See Section 4.3.2. The boards are also permitted to be used as interior wall insulation and general insulation; in insulating concrete form systems when listed as

a component of the system in a current ICC-ES evaluation report; in other proprietary wall systems recognized in a current evaluation report; and as the core material for R-Control Structural Insulated Panels and R-Control FireFinish Structural Insulated Panels when installed as noted in Sections 4.4 and 4.5.

R-Control® Perform Guard® EPS shall be installed in combination with Do-All-Ply®.

4.3.2 Special Use—Wood Construction in Areas of Very Heavy Termite Infestation: R-Control Perform Guard® EPS boards are termite-resistant and are not restricted under Section R324.4 of the IRC, Section 2603.3 of the SBC, or Section 323.4 of the I1&2.

4.4 R-Control® Structural Insulated Panels:

Each structure built using R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels shall be designed by a registered design professional. Drawings shall be provided that bear the design professional's registered stamp or seal when application is made for a building permit. Such drawings shall contain specific instructions with regard to connections, erection, and installation of the panels, and shall be available at all times on the jobsite during installation.

For jurisdictions enforcing the IRC, the structural insulated panels shall be designed in accordance with the IBC.

The R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels are connected to each other at the panel edges through the use of splines. The splines are field-coated with Do-All-Ply® adhesive/sealant and fastened with 8d box nails at 6 inches (152.4 mm) on center, or an approved equal.

The top and bottom plates of the panel are dimensional wood plates sized to match the core thickness and installed with Do-All-Ply® and fastened with 8d box nails at 6 inches (152.4 mm) on center, or an approved equal. Do-All-Ply® adhesive/sealant is applied along the base plate prior to the panel placement.

In jurisdictions enforcing the IBC and the IRC, use of the panels as shear walls (racking shear) is limited to structures in Seismic Design Categories A, B and C.

4.4.1 Allowable Structural Loads for Panels: Allowable axial, transverse, racking, header, and diaphragm loads are noted in Tables 2 through 9. For loads greater than those specified in Tables 2 through 7 and Table 9, the specific condition shall be framed by other methods to meet applicable code requirements.

Openings in the wall panels shall be limited to 48 inches (1219 mm) in width and to the allowable loads specified in Table 8. For openings greater than 48 inches (1219 mm), loads shall not exceed the those indicated in the header load design chart or shall be framed to meet current requirements in the applicable code.

4.4.2 Panel Cladding:

4.4.2.1 Roof Covering: The roof covering shall comply with the applicable code. Underlayment and flashing shall be installed in accordance with the applicable code. Roofs with hot-asphalt or hot-coal tar pitch are prohibited.

4.4.2.2 Wall Covering: Panels, at the time of their erection and placement, shall be covered on the exterior by a water-resistive barrier as required by the applicable code. Under Section 2510.6 of the IBC and Section 2506.4 of the UBC, when exterior plaster is applied over wood-based sheathing, the water-resistive barrier shall include two layers of Grade D paper. The exterior of the wall panels shall be covered with an approved exterior wall covering. Installation methods shall be in accordance with the manufacturer's recommendations subject to approval by the local code official.

4.4.2.3 Interior: Panels shall be covered on the interior of the building by an approved 15-minute thermal barrier.

4.4.3 One-hour Fire-resistance-rated Roof-ceiling Assemblies—R-Control® Structural Insulated Panels: R-Control Structural Insulated Panels, with a minimum $3^1/_2$-inch-thick (88.90 mm) EPS core and $^7/_{16}$-inch-thick (11.11 mm) OSB on each face, are permitted to be used as components of the following UL design assemblies:

4.4.3.1 (See Figure 1): Restrained Assembly Rating, 1 Hour; Unrestrained Assembly Rating, 1 Hour:

1. Wood beam: Minimum $4^1/_2$-inch-wide-by-$9^1/_2$-inch-deep (114 mm by 241 mm) wood beam, spaced in accordance with the applicable code.
2. Roof covering: Consisting of hot-mopped or cold-application materials compatible with the AFM R-Control panels that comply with the code as Class A, B or C roof coverings. For hot-mopped applications, a base ply is required.

   In lieu of the item described immediately above, a roof covering consisting of a single-ply roofing membrane that is either ballasted, adhered or mechanically attached is permitted under the membrane manufacturer's current ICC-ES evaluation report.
3. AFM R-Control® Panels: Minimum $3^1/_2$-inch-thick-core (89 mm) panels, with minimum $^7/_{16}$-inch-thick (11.1 mm) OSB facings.
4. Side plates: Nominal 2-inch-thick wood members, installed in each side joint of the AFM R-Control panels, and fastened through the OSB panels with 8d common nails spaced 8 inches (203 mm) on center.

   End plates: Nominal 2-inch-thick wood blocking installed in each end joint, and fastened through the OSB panels with 8d common nails spaced 6 inches (152 mm) on center.
5. Gypsum wallboard: Minimum $^5/_8$-inch-thick (15.9 mm), 4-foot-wide (1219 mm) panels complying with ASTM C 36-92 (IRC: ASTM C 36-97) as Type X are installed in two layers with the long dimension perpendicular to the wood beams. The inner layer is attached to the panels using $1^1/_4$-inch-long (31.7 mm), Type S, buglehead steel screws spaced 8 inches (203 mm) on center along the joints and in rows spaced 16 inches (406 mm) on center, located $^1/_2$ inch (12.7 mm) from the edges. The joints of the inner layer of the wallboard must be staggered from the joints of the panels. The outer layer is attached to the panels using 2-inch-long (51 mm), buglehead steel screws spaced 8 inches (203 mm) on center along the edges and located $^3/_4$ inch (19.1 mm) from the edge, and in rows 12 inches (305 mm) on center in the field. The joints of the outer layer must be staggered from the joints of the inner layer. For beams, two layers of $^5/_8$-inch (15.9 mm) gypsum wallboard are fastened to the wood beam using $1^1/_4$-inch-long (31.8 mm), Type S, buglehead steel screws spaced 8 inches (203 mm) on center, with the outer layer fastened to the wood beam using 2-inch-long (51 mm), Type S, buglehead steel screws.
6. Joint system: Outer wallboard joints are covered with paper tape and joint compound. Screw heads are covered with joint compound.

4.4.3.2 (See Figure 2): Restrained Assembly Rating, 1 Hour; Unrestrained Assembly Rating,1 Hour:

1. Steel joist: Type 10K1, minimum size, designed, constructed and installed in accordance with the standard

specification for steel joists, K Series, LH Series, DI H Series and Joist Girders, 1994, as referenced in Section 2206 of the IBC, Section 2221 of the UBC, or Section 2205 of the SBC and the BNBC.

2. Roof covering: Consisting of hot-mopped or cold-application materials compatible with the AFM R-Control Panels that comply with the applicable code as Class A, B or C coverings. For hot-mopped applications, a base ply is required.

   In lieu of the item described immediately above, a roof covering consisting of a single-ply roofing membrane that is either ballasted, adhered or mechanically attached is permitted under the membrane manufacturer's current ICC-ES evaluation report.

3. AFM R-Control Panels: Minimum $3^1/_2$-inch-thick-core (89 mm) panels with minimum $^7/_{16}$-inch-thick (11.1 mm) OSB facings.

4. Spline: Nominal 4-inch-wide-by-$^7/_{16}$-inch-thick OSB spline installed between the AFM R-Control panels in accordance with spline detail SIP-102 shown in Table 4.

   End plates: Nominal 2-inch-wide wood blocking installed in each end joint and fastened through the OSB panel with 8d common nails spaced 6 inches (152 mm) on center.

5. Metal lath: Diamond mesh, $^3/_8$-inch (9.5 mm) expanded galvanized steel lath weighing 3.4 pounds per square yard (1.3 kg/m^2), complying with Section 2505.3 of the UBC (IBC/IRC: ASTM C 847-97). The lath is secured to one side of the joist using No. 20 SWG steel tie wire located at the mid height of every other web member. Additional lath is installed on the bottom surface of building units and secured by means of 1-inch-wide-by-$1^1/_2$-inch-long (25.4 mm by 38 mm) staples spaced 7 inches (178 mm) on center.

6. Spray-applied fire-resistive materials: The material is Type DC-F, recognized in ICC-ES reports ER-1244 and 9423E. Type DC-F is prepared and applied to wetted surfaces of steel joists, to the bottom surfaces of the AFM R-Control Panels, and to metal lath, all of which are made free of dirt, oil or loose scale by spraying with water, to achieve a minimum $2^1/_4$-inch (57 mm) thickness. The specified fiber density requires a minimum individual fiber density of 11 pcf (176 kg/m^3). For areas in which the fiber density is between 10 and 11 pcf (160 and 176 kg/m^3), the fiber thickness must be increased in accordance with the following formula:

$$Thickness,\ inch = \frac{11\,(Design\ Thickness,\ inch)}{(Actual\ Fiber\ Density,\ pcf)}$$

$$\text{For } \textbf{SI}\text{: Thickness, mm} = \frac{176\,(Design\ Thickness,\ mm)}{(Actual\ Fiber\ Density\ \frac{(kg)}{m^3})}$$

Fiber density must not be less than 10 pcf (160 kg/m^3). For method of density determination, refer to UBC Standard 7-6, or Section 1704.11 of the IBC, or Section 1705.12 of the BNBC, or Section 1709 of the SBC. Other installation and inspection requirements are described in ICC-ES reports ER-1244 and 9423E.

4.4.4 Fire-resistance Wall Assemblies—R-Control® Structural Insulated Panels:

4.4.4.1 One-hour Fire-resistance-rated Bearing Wall Assembly: R-Control Structural Insulated Panels with minimum $3^1/_2$- to maximum $5^1/_2$-inch (88.90 mm to 139.7 mm) EPS core and $^7/_{16}$-inch-thick (11.1 mm) OSB facings are installed with top and bottom plates attached to the OSB facings with 12d common nails spaced 12 inches (304.8 mm) on center. The panels are covered with two layers of $^5/_8$-inch-thick (15.88 mm), Type X gypsum wallboard on each face. Where the panels are exposed to the exterior, the exterior side shall have $^5/_8$-inch-thick (15.9 mm), Type X, water-resistant core gypsum sheathing complying with ASTM C 79, instead of the gypsum wallboard. The gypsum wallboard is installed vertically, with all joints staggered 16 inches (406.4 mm) on center. The first layer of gypsum is secured with $1^5/_8$-inch-long (41.28 mm) and the second with 2-inch-long (50.8 mm), bugle head self-tapping screws, each spaced 12 inches (304.8 mm) on center along the perimeter and 24 inches (609.6 mm) on center in the field. The joints are taped and the nails are covered with joint compound. The wall is limited to 9 feet (2.70 m) in height and a maximum superimposed allowable bearing load of 1,800 plf (26 269.02 N/m).

4.4.4.2 One-hour Fire-resistive-rated Bearing Wall: One-hour fire-resistive-rated with a $5^1/_2$-inch (139.7 mm) EPS core and $^7/_{16}$-inch (11.11 mm) OSB skins. The EPS core is recessed $1^1/_2$ inches (38.1 mm) along the edges of the panels (along the bottom and both sides), and 3 inches (76.2 mm) along the top, to allow for the installation of nominal 2-by-6 wood studs (No. 2 hem-fir), bottom plate, studs and double top plates. Double studs are assembled together with 16d coated sinker nails, spaced 24 inches (609.6 mm) on center and staggered along the stud length. The double studs are installed in the recesses between adjoining panels and secured to the OSB with 6d common nails, spaced 6 inches (152.4 mm) on center, after the surfaces have been caulked, with R-Control Structural Building Panel Seal Latex All-Purpose Caulk, to be in contact with the EPS core. A gap of $^1/_8$ inch (3.18 mm) is left between adjoining edges of the OSB panel facers. The single bottom plate is secured to the OSB with 6d common nails spaced 6 inches (152 mm) on center, and to each wood stud with two 16d coated sinker nails, after the surfaces have been caulked, with R-Control Structural Building Panel Seal Latex All-Purpose Caulk, to be in contact with the EPS core. The first top plate is secured to each stud with two16d coated sinker nails, after the surfaces have been caulked, with R-Control Structural Building Panel Seal Latex All-Purpose Caulk, to be in contact with the EPS core. The second top plate is installed over the first and secured to the OSB with 6dcommon nails spaced 6 inches (152.4 mm) on center, and to the first top plate with 16d coated sinker nails, spaced 16 inches (406.4 mm) on center, and staggered along the top plate length.

Electrical chases, $1^1/_2$ inches (38.1 mm) in diameter, are permitted to be installed horizontally in the wall, 16 inches (406.4 mm) and 45 inches (1142 mm) above the bottom of the wall.

The panels are covered with one layer of $^5/_8$-inch (15.88 mm) Standard Gypsum Co. Type SG-C gypsum fire-rated wallboard on each face, and secured to the OSB with PC cupped-head drywall nails, $1^5/_8$ inches (41.28 mm) long, spaced 8 inches (203.2 mm) on center along the perimeter of the wallboard and 12 inches (304.8 mm) on center vertically and 16 inches (406.4 mm) on center horizontally in the field of the board. The joints of the wallboard are treated with joint compound and paper tape. The nails are covered with joint compound. The wall is limited to 10 feet (3 m) in height and a superimposed allowable bearing load of 2,200 plf (32 107N/m).

4.5 R-Control FireResist® Structural Insulated Panels: R-Control FireResist Structural Insulated Panels are permitted to be installed in the same manner as the R-Control

Structural Insulated Panels. (See Section 4.4.) When the inorganic coating is oriented to the interior of the building, the R-Control FireResist Structural Insulated Panels do not require a supplemental thermal barrier.

R-Control FireResist Structural Insulated Panels use R-Control Perform Guard EPS as the termite-resistant core material. See Section 4.3.

5.0 CONDITIONS OF USE

The R-Control® EPS Boards, R-Control® Perform Guard® EPS Boards, R-Control® Structural Insulated Panels, and R-Control® FireResist® Structural Insulated Panels as described in this report comply with or are suitable alternates to what is specified in the codes specifically listed in Section 1.0 of this report, subject to the following conditions:

5.1 R-Control® EPS Boards, R-Control® Perform Guard® EPS Boards, and R-Control® Structural Insulated Panels shall be fully protected from the interior of the building by an approved 15-minute thermal barrier, except for:

- R-Control® EPS Boards as permitted in Section 4.2.2 of this report.
- R-Control® FireResist® Structural Insulated Panels as permitted in Section 4.5 of this report.

5.2 When R-Control® EPS Boards are used with wood construction, see Section 4.2 of this report.

5.3 R-Control® EPS Boards and R-Control® Perform Guard® EPS Boards shall not be used as structural sheathing. Walls on which the boards are applied shall be braced in accordance with the applicable code.

5.4 When R-Control® EPS boards and R-Control® Perform Guard® EPS Boards are used in Type I, II, III or IV (noncombustible) construction, the boards shall be installed in accordance with a separate, current evaluation report or the installation shall be justified to the satisfaction of the building official.

5.5 R-Control® EPS Boards and R-Control® Perform Guard® EPS Boards shall not be used as nailing bases for exterior siding materials.

5.6 Each structure built using R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels shall be designed by a registered design professional. Construction documents, including engineering calculations and drawings providing floor plans, window details, door details, and connector details, shall be submitted to the code official when application is made for a permit. The individual preparing such documents shall posses the necessary credentials regarding competency and qualifications as required by the applicable code and the professional registration laws of the state where the construction is undertaken. These documents are not covered by this report.

5.7 Design loads to be resisted by R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels shall be determined based on the design loads in the applicable code. Loadings on the panels shall not exceed those noted in this report. Calculations demonstrating that the loads applied to the panels are less than the allowable loads described in this report shall be submitted to the code official for approval.

5.8 R-Control® Structural Insulated Panels, R-Control® EPS Boards, R-Control® FireResist® Structural insulated Panels and R-Control® Perform Guard® EPS Boards shall be used only on buildings of combustible construction.

5.9 R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels fabricated with EPS foam cores with thicknesses of $7^1/_4$, $9^1/_4$ and $11^1/_4$ inches (184.15, 234.95 and 285.75 mm) are used only as roof panels.

5.10 In jurisdictions that have adopted the SBC, the I1&2, and the IRC, when use is in areas of very heavy termite infestation, the bottom of R-Control® Structural Insulated Panels and R-Control FireResist® Structural Insulated Panels shall not be less than 6 inches (153 mm) above finish grade, and the panels shall not be installed below grade or in contact with earth. See Section 2603.3 of the SBC, Section 323.1 of the I1&2, and Section R324.4 of the IRC.

5.11 R-Control EPS Boards, R-Control Perform Guard® EPS Boards, R-Control® Structural Insulated Panels and R-Control Fire Resist® Structural Insulated Panels shall not be used as an integral part of a fire-rated assembly unless test reports substantiating their performance are submitted to the code official when application is made for a permit. R-Control® Structural Insulated Panels and R-Control FireResist® Structural Insulated Panels are permitted to be used in fire-resistive assemblies when installation is as described in Sections 4.4.3 and 4.4.4 of this report.

5.12 Heat-producing fixtures shall not be installed in the panels unless protected by a method approved by the code official or documented in test reports prepared by an approved testing laboratory. This limitation shall not be interpreted to prohibit heat-producing elements with suitable protection.

5.13 In jurisdictions enforcing the IBC and the IRC, use of the panels as shear walls (racking shear) is limited to structures in Seismic Design Categories A, B and C.

5.14 The products are manufactured by the listees at the locations specified in Table 10 under a quality control program with inspections by Underwriters Laboratories Inc. (AA-668).

6.0 EVIDENCE SUBMITTED

6.1 R-Control® EPS Boards:

Data in accordance with the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2006; and a test report on crawl space comparative fire testing with independent engineering analysis.

6.2 R-Control® Perform Guard® EPS Boards:

Data in accordance with the ICC-ES Evaluation Guideline for Termite-resistant Foam Plastics (EG239), dated November 2003; and the ICC-ES Acceptance Criteria for Foam Plastic Insulation (AC12), dated June 2006.

6.3 R-Control® Structural Insulated Panels and R-Control® FireResist® Structural Insulated Panels:

Data in accordance with the ICC-ES Acceptance Criteria for Sandwich Panels (AC04), dated May 2006; and reports of tests in accordance with UBC Standards 7-1 and 26-3, ASTM E 119 and UL 1715.

7.0 IDENTIFICATION

Each of AFM Corporation's R-Control® EPS Boards and R-Control® Perform Guard® EPS Boards, as described in this report, is marked with the report holder's name (AFM) and the plant ID number; the product type; the name or logo of the inspection agency (Underwriters Laboratories Inc.); and the evaluation report number (ESR-1006). Additionally, an inspection agency certificate, including the flame-spread index, the smoke-developed index, and the thermal-

resistance *R*-value, is provided with each shipment of insulation boards.

Each structural insulated panel, as described in this report, is marked with the report holder's name (AFM) and plant ID number; the product name (R-Control® Structural Insulated Panels or R-Control® FireResist® Structural Insulated Panels); the name or logo of the inspection agency (Underwriters Laboratories Inc.); and the evaluation report number (ESR-1006). Additionally, an inspection agency certificate, including the flame-spread and smoke-developed indices of the foam plastic panel core, is provided with each shipment of panels.

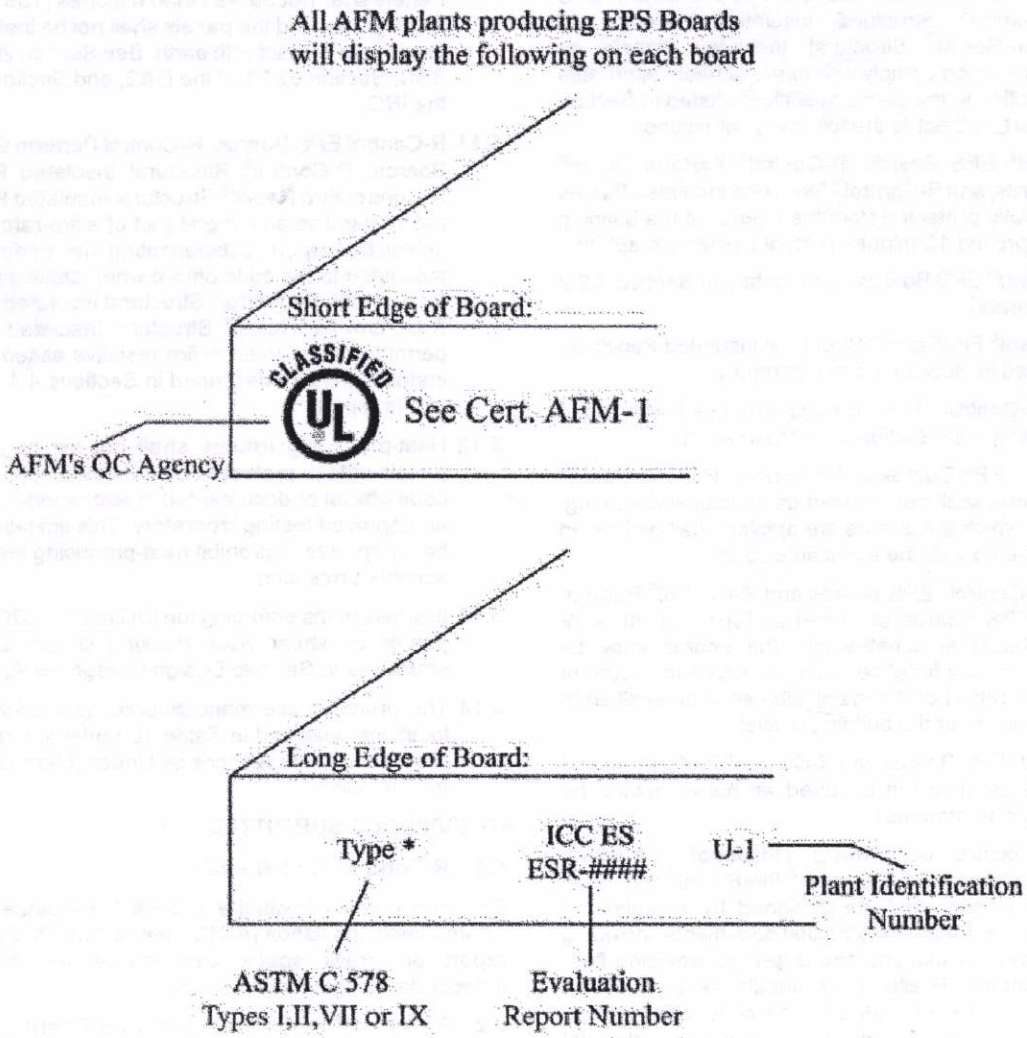


TABLE 1—PHYSICAL PROPERTIES

PROPERTY	TYPE I	TYPE VIII	TYPE II	TYPE IX
Density, min., lb/ft^3 (kg/m^3)	0.90 (15)	1.15 (18)	1.35 (22)	1.80 (29)
Thermal Resistance, min., per 1.0 in. thickness 75°F.-ft^2-h/Btu (°K-m^2/W)	3.60 (0.63)	3.80 (0.67)	4.00 (0.70)	4.20 (0.74)
Compressive strength @ 10% def., min. psi (kPa)	10.0 (69)	13.0 (90)	15.0 (104)	25.0 (173)
Flexural strength min., psi (kPa)	25.0 (173)	30.0 (208)	35.0 (240)	50.0 (345)
Water vapor permeance of 1.0 in. thickness max., perm	5.0	3.5	3.5	2.0
Water absorption by total immersion, max., volume %	4.0	3.0	3.0	2.0

WALL—UNITY EQUATION

This equation is used to determine design suitability. The equation takes into account the ultimate load for a panel subjected to both axial and transverse (bending) conditions:

$$\frac{\textit{design axial load}}{\textit{allowable axial load}} + \frac{\textit{design transverse load}}{\textit{allowable transverse load}} \leq 1$$

(See Load Design Table 2) (See Load Design Table 4)

TABLE 2—WALL AXIAL LOADING[1,2,3,4,5]
(See Detail SIP-101)

R-CONTROL® STRUCTURAL INSULATED PANELS			
	Panel Height	$^7/_{16}$® OSB Thickness	
		EPS Core Thickness	
		$3^1/_2$-inch Core	$5^1/_2$-inch Core
Axial Load[1] (plf)	8′ - 0″	2,750	4,000
	10′ - 0″	2,500	3,500
	12′ - 0″	2,000	3,000
	14′ - 0″	—	2,750
	16′ - 0″	—	2,500

For **SI:** 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 47.9 Pa, 1 plf = 14.59 N/m.
N/A = not applicable.

[1]Maximum allowable axial load is limited to the loads tabulated for axial condition alone.
[2]Ultimate failure load divided by a safety factor of 3.0.
[3]For fire-resistive assemblies, see Section 4.4.4 for axial loading.
[4]Values based on a maximum height-to-width ratio of $3^1/_2$:1.
[5]See plate connection detail SIP-101.

TABLE 3—SHEAR LOADING
(See Detail SIP-101)

R-CONTROL® STRUCTURAL INSULATED PANELS			
	Panel Height	$^7/_{16}$-inch OSB Thickness	
		EPS Core Thickness	
		$3^1/_2$-inch Core	$5^1/_2$-inch Core
Racking Shear	N/A	335 plf	335 plf

[1]Vertical boundaries (shear walls) require double studs.

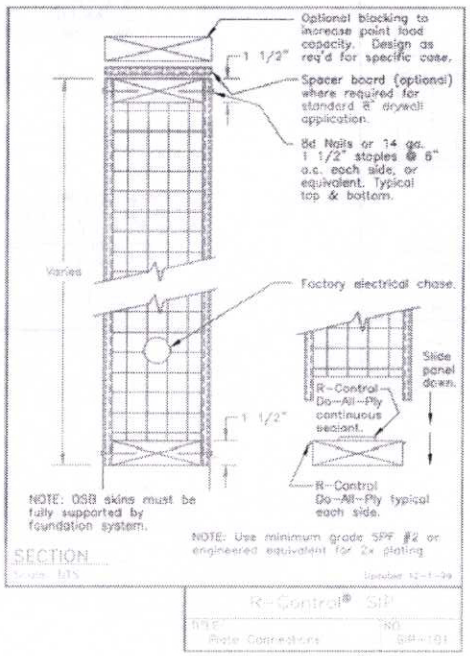
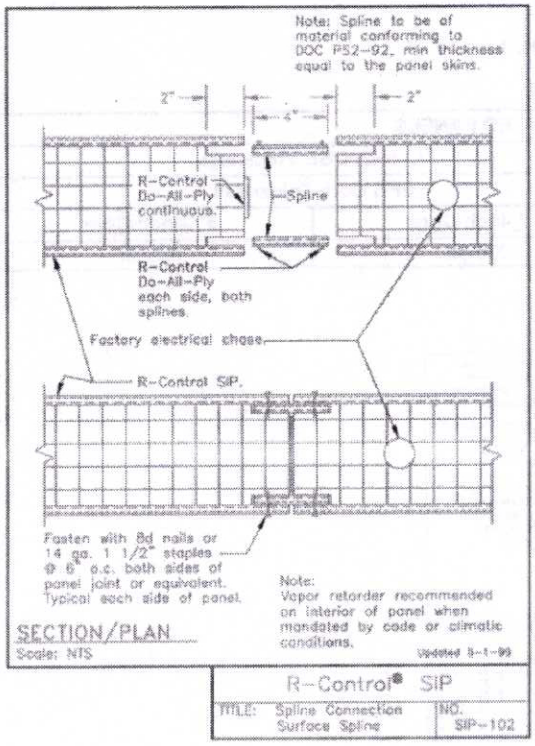


TABLE 4—TRANSVERSE LOADING (psf)[2,3,4]
(See Details SIP-102 and SIP-102g)

R-CONTROL® STRUCTURAL PANELS																
Roof and Wall or Floor Panel Span		$^{7}/_{16}$-inch OSB Thickness														
		EPS Core Thickness														
		$3^{1}/_{2}$-inch Core			$5^{1}/_{2}$-inch Core			$7^{1}/_{4}$-inch Core			$9^{1}/_{2}$-inch Core			$11^{1}/_{4}$-inch Core		
Deflection		L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180
Transverse Load (psf)	4′ - 0″	65	80[1]	80[1]	89	122[1]	122[1]	92	136[1]	136[1]	107	136[1]	136[1]	104	136[1]	136[1]
	6′ - 0″	40	53[1]	58	81[1]	81[1]	64	96[1]	96[1]	75	96[1]	96[1]	96[1]	73	96[1]	96[1]
	8′ - 0″	28	40[1]	40[1]	42	61[1]	61[1]	51[1]	76[1]	76[1]	61	76[1]	76[1]	60	76[1]	76[1]
	10′ - 0″	20	30	32[1]	32	48	49[1]	44	64[1]	64[1]	54[1]	64[1]	64[1]	55	64[1]	64[1]
	12′ - 0″	15	22	27[1]	26	38	41[1]	40	56[1]	56[1]	51	56[1]	56[1]	55	56[1]	56[1]

For **SI:** 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 47.88 Pa.
NP = not permitted

[1]Limited to ultimate failure load divided by a safety factor of 3.0.
[2]Floor panels limited to Group R Occupancies.
[3]Wall panels have $7^{1}/_{2}$-inch maximum core thickness.
[4]See surface spline detail SIP-102 and SIP-102g.



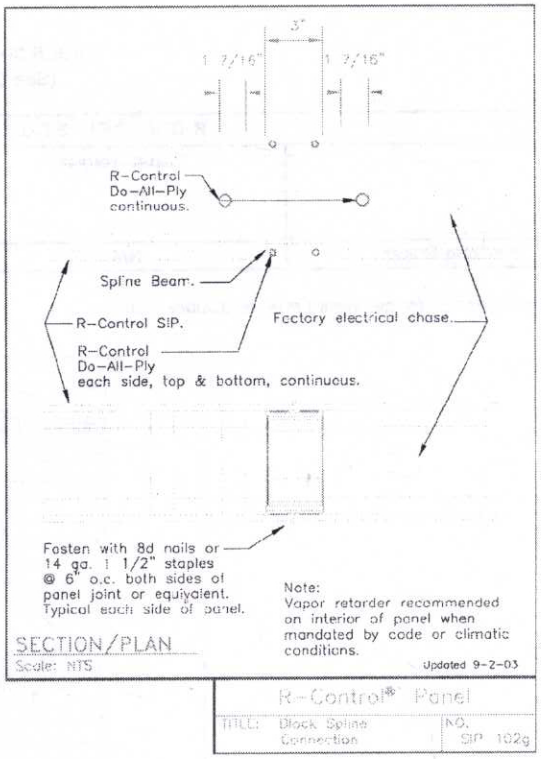
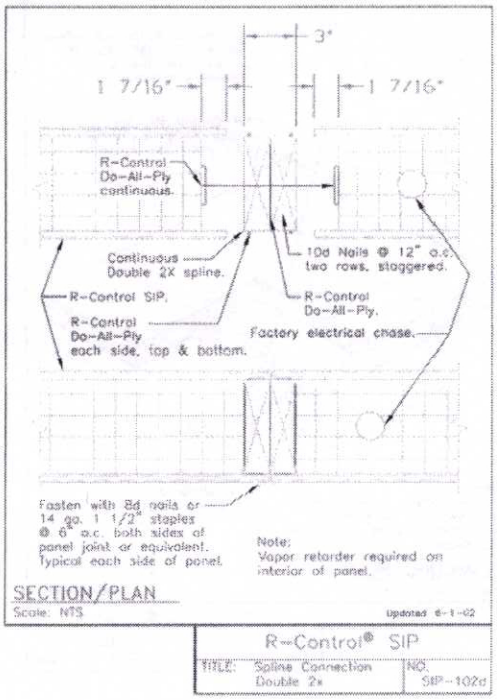


TABLE 5—TRANSVERSE LOAD[2,3,4]
(See Details SIP-102d and SIP-108)

R-CONTROL® STRUCTURAL INSULATED PANELS													
Roof, Wall or Floor Panel Span		$^{7}/_{16}$-inch OSB Thickness											
		EPS Core Thickness											
		$5^{1}/_{2}$-inch Core			$7^{1}/_{4}$-inch Core			$9^{1}/_{4}$-inch Core			$11^{1}/_{4}$-inch Core		
Deflection		L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180
Transverse Load (psf)	10′ - 0″	53	79	105[1]	89	109[1]	109[1]	150	174[1]	174[1]	177[1]	177[1]	177[1]
	12′ - 0″	40	59	79	65	91[1]	91[1]	111	145[1]	145[1]	148[1]	148[1]	148[1]
	14′ - 0″	30	45	60	48	72	78[1]	84	124[1]	124[1]	115	127[1]	127[1]
	16′ - 0″	24	35	47	37	55	68[1]	65	98	109	89	111	111[1]
	18′ - 0″	19	28	37	28	42	57	51	77	97[1]	70	99[1]	99[1]
	20′ - 0″	15	22	30	22	33	44	41	61	82	56	84	89[1]
	22′ - 0″	NP	NP	NP	NP	NP	NP	33	49	66	45	68	81[1]
	24′ - 0″	NP	NP	NP	NP	NP	NP	27	40	54	37	55	74

For **SI:** 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 47.9 Pa.
NP = not permitted

[1]Limited to ultimate failure load divided by a safety factor of 3.0.
[2]Roof, wall and floor panels are framed with continuous doubled nominal 2-inch lumber in the spanning direction, spaced 4 feet on center, and single nominal 2-inch lumber at panel ends. Lumber is minimum spruce-fire No. 2 grade. Panels below heavy line require Douglas fir–larch, No. 2 grade lumber.
[3]Top facing thickness for floor panels is $^{3}/_{4}$ inch, minimum. As an option, minimum $^{7}/_{16}$-inch top facing may be overlaid with a minimum $^{7}/_{16}$-inch finish flooring perpendicular to the panels.
[4]See details SIP-102d and SIP-108.



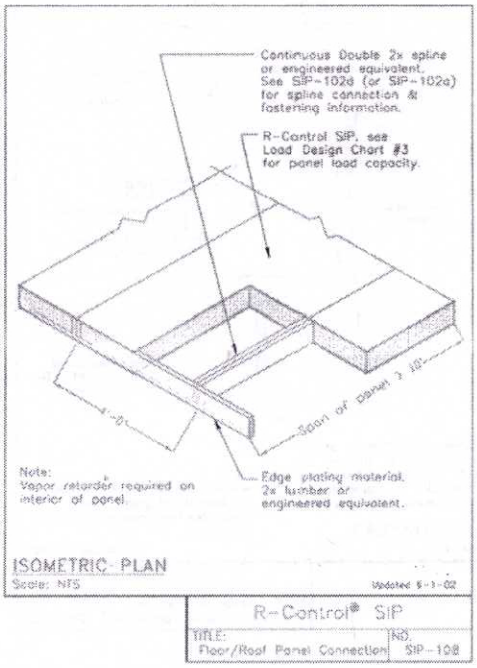
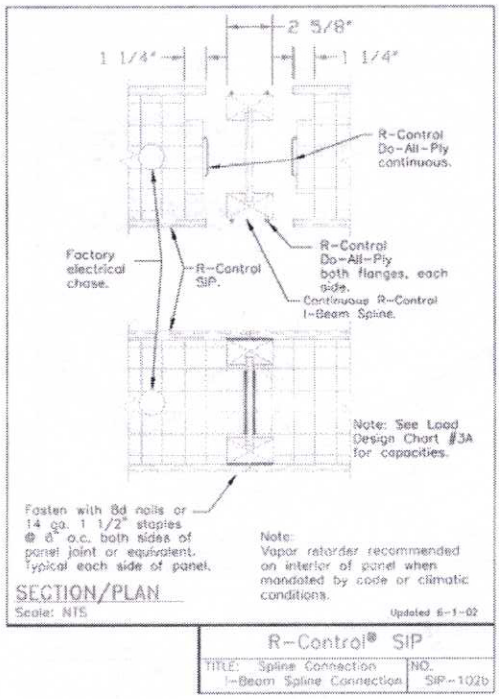


TABLE 6—TRANSVERSE LOADING[2,3,4,5]
(See Details SIP-102b and SIP-108a)

R-CONTROL® STRUCTURAL INSULATED PANELS										
Roof or Floor Panel Span		$^{7}/_{16}$-inch OSB Thickness								
		EPS Core Thickness								
		$7^{1}/_{4}$-inch Core			$9^{1}/_{4}$-inch Core			$11^{1}/_{4}$-inch Core		
Deflection		L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180
Transverse Load (psf)	10′ - 0″	81[1]	81[1]	81[1]	118[1]	118[1]	118[1]	131[1]	131[1]	131[1]
	12′ - 0″	63	68[1]	68[1]	98[1]	98[1]	98[1]	109	109[1]	109[1]
	14′ - 0″	49	58[1]	58[1]	73	84[1]	84[1]	87	93[1]	93[1]
	16′ - 0″	38	51[1]	51[1]	55	74[1]	74[1]	69	82[1]	82[1]
	18′ - 0″	30	45[1]	45[1]	42	63	65[1]	55	72	72
	20′ - 0″	24	37	40[1]	33	49	59[1]	45	65	65
	22′ - 0″	NP	NP	NP	26	39	49[1]	37	55	57[1]
	24′ - 0″	NP	NP	NP	21	31	41	30	46	48[1]

For **SI:** 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 47.9 Pa.
NP = not permitted.

[1]Limited to ultimate failure load divided by a safety factor of 3.0.
[2]Panels require continuous wood I-beams installed in the spanning direction spaced 4 feet on center.
[3]Top facing thickness for floor panels in minimum $^{3}/_{4}$ inch. As an option, the minimum $^{6}/_{16}$-inch-thick top facing may be overlaid with minimum $^{7}/_{16}$-inch-thick finish flooring perpendicular to the panels.
[4]Wood I-joist is SWI-T-34 recognized in ICC-ES legacy report PFC-4801.
[5]See details SIP-102b and SIP-108a.



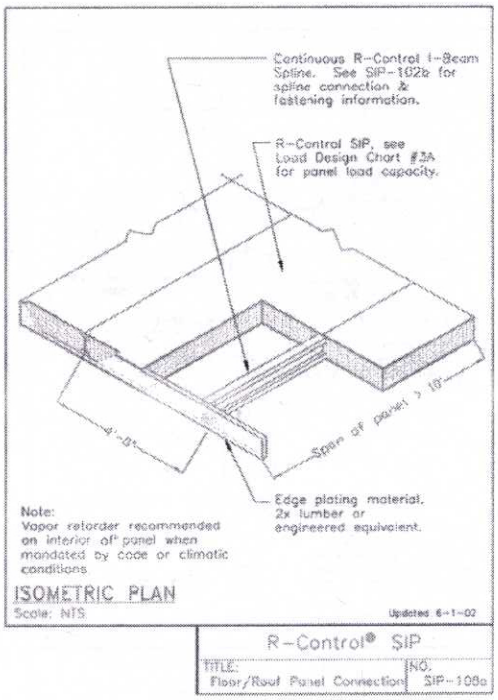
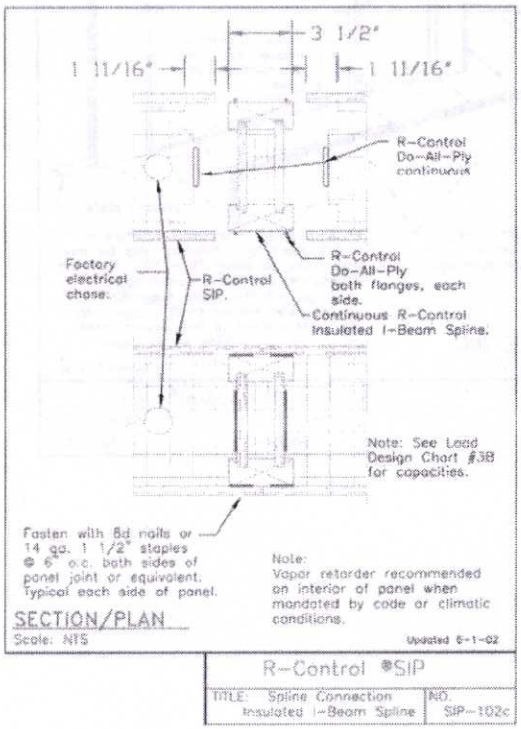


TABLE 7—TRANSVERSE LOADING[2,3,4]
(See Details SIP-102c and SIP-108b)

R-CONTROL® STRUCTURAL INSULATED PANELS													
Roof or Floor Panel Span		$^{7}/_{16}$-inch OSB Thickness											
		EPS Core Thickness											
		$5^{1}/_{2}$-inch Core			$7^{1}/_{4}$-inch Core			$9^{1}/_{4}$-inch Core			$11^{1}/_{4}$-inch Core		
Deflection		L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180	L/360	L/240	L/180
Transverse Load (psf)	10′ - 0″	76	114	132[1]	101	151	158[1]	117	138[1]	138[1]	149[1]	149[1]	149[1]
	12′ - 0″	57	79	96[1]	72	109	132[1]	88	115[1]	115[1]	124[1]	124[1]	124[1]
	14′ - 0″	38	57	70[1]	54	80	107[1]	68	98[1]	98[1]	106[1]	106[1]	106[1]
	16′ - 0″	28	42	54[1]	40	61	81	53	80	86[1]	76	93[1]	93[1]
	18′ - 0″	21	32	42	31	47	62	42	64	64[1]	64	83	83
	20′ - 0″	16	24	32	24	36	49	34	51	52[1]	50	74[1]	74[1]
	22′ - 0″	NP	NP	NP	NP	NP	NP	28	42	43[1]	40	60	62
	24′ - 0″	NP	NP	NP	NP	NP	NP	23	34	36[1]	33	49	52[1]

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 psf = 47.9 Pa.
NP = not permitted

[1]Limited to ultimate failure load divided by a safety factor of 3.0.
[2]Panels require continuous insulated spline beams installed in the spanning direction spaced 4 feet on center.
[3]Top facing thickness for floor panels is $^{3}/_{4}$ inch, minimum. As an option, the minimum $^{7}/_{16}$-inch-thick top facing may be overlaid with minimum $^{7}/_{16}$-inch-thick finish flooring perpendicular to the panels.
[4]See details SIP-102c and SIP-108b.



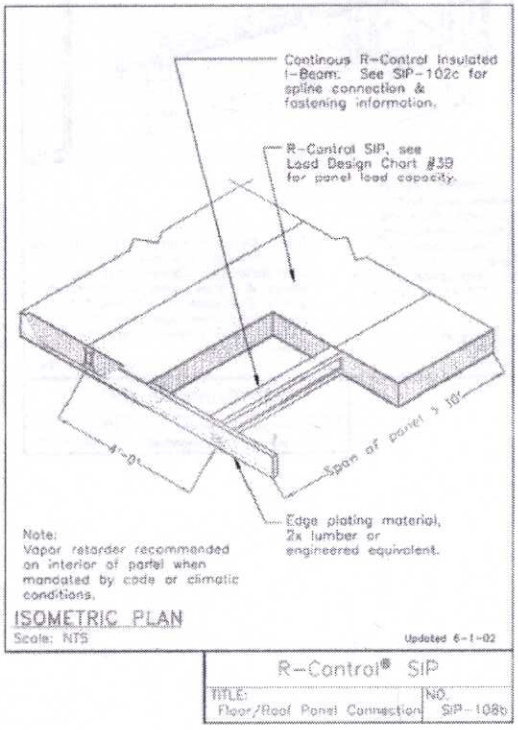
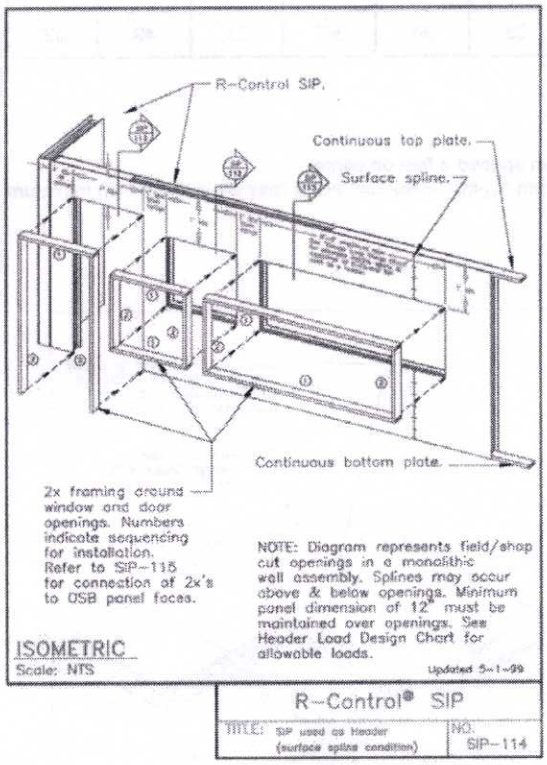


TABLE 8—WALL-HEADER LOADING
(See Details SIP-112 and SIP-114)

R-CONTROL® STRUCTURAL INSULATED PANELS[2,3,4,5]										
Header Span		Header Depth								
		12 inches			18 inches			24 inches		
Deflection		L/480	L/360	L/240	L/480	L/360	L/240	L/480	L/360	L/240
Load (plf)	4′ - 0″	524	703	708[1]	762	773[1]	773[1]	837[1]	837[1]	837[1]
	6′ - 0″	319	374[1]	374[1]	466[1]	466[1]	466[1]	557[1]	557[1]	557[1]
	8′ - 0″	218	248[1]	248[1]	351[1]	351[1]	351[1]	455[1]	455[1]	455[1]

For **SI:** 1 inch = 25.4 mm, 1 plf = 14.59 N/m.

[1]Limited to ultimate failure load divided by a safety factor of 3.0.
[2]See details SIP-112 and SIP-114.
[3]Supports and connections shall be designed for each installation.
[4]Top and bottom plates shall be Douglas fir No. 2.
[5]See details SIP-112 and SIP-114.



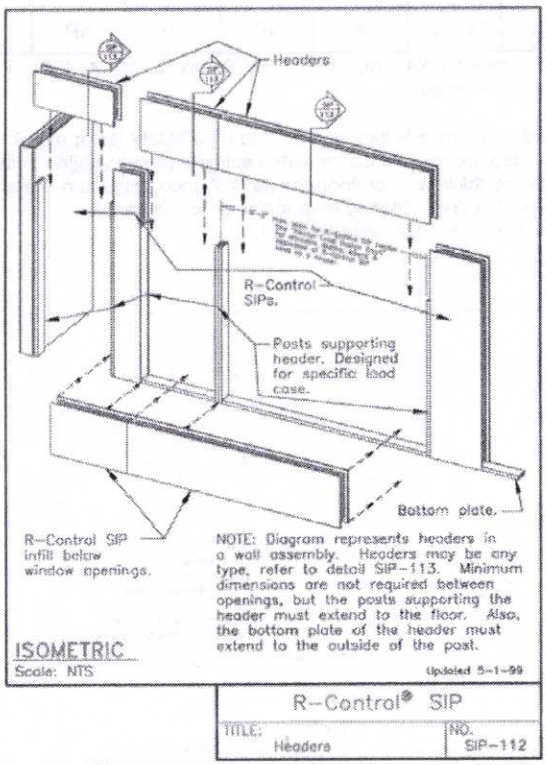
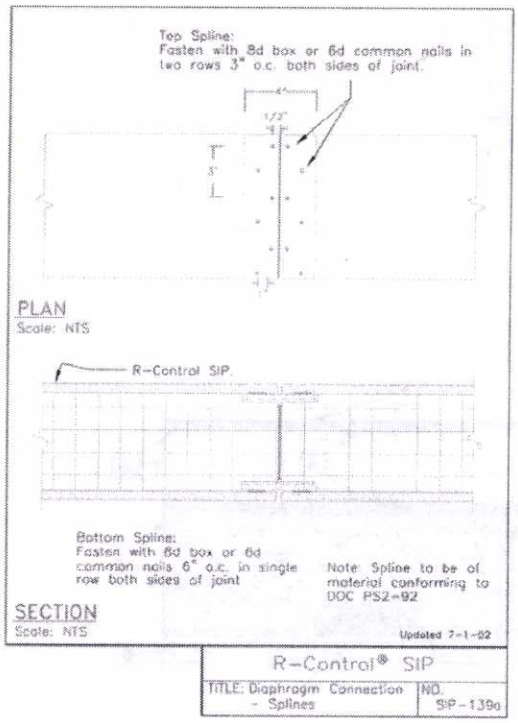


TABLE 9—ROOF/FLOOR-DIAPHRAGM LOADING[2]
(See connection details SIP-139a, SIP-140 and SIP-141)

R-CONTROL® STRUCTURAL INSULATED PANELS			
$^{7}/_{16}$-inch OSB Thickness	Spacing of R-Control Screw Fasteners at supported edges (minimum $1^{5}/_{8}$ inch penetration)		
	3 inches	4 inches	6 inches
	Spacing of spline fasteners (8d box or 6d common) at unsupported edges—top side of panel only—two staggered rows of fasteners on each side of joint.		
	3 inches	3 inches	3 inches
	850 plf[1]	750 plf[1]	500 plf[1]

[1]Spline is $^{7}/_{16}$-inch OSB × 4.
[2]See details SIP-139a, SIP-140, and SIP-141.



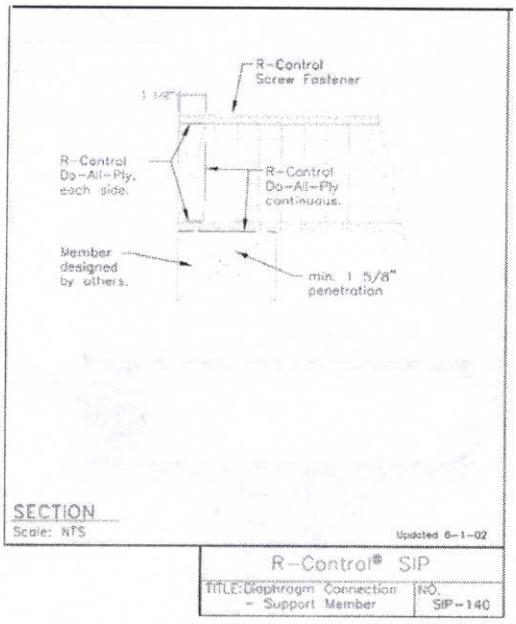
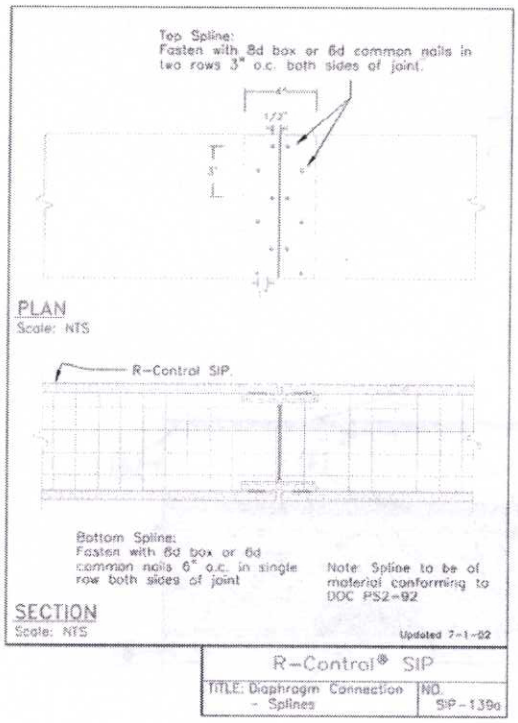
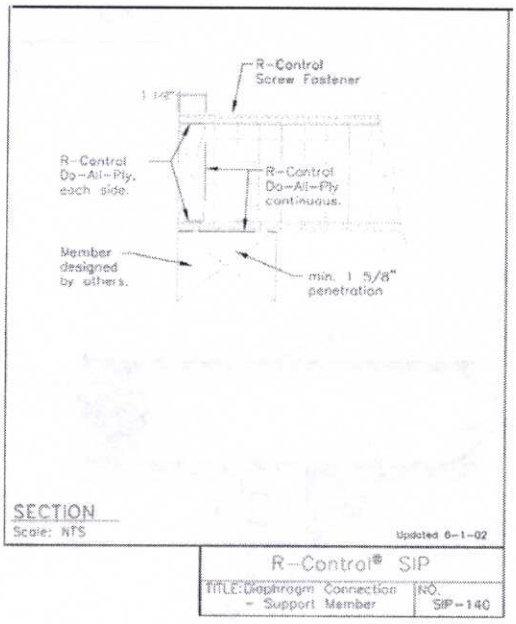


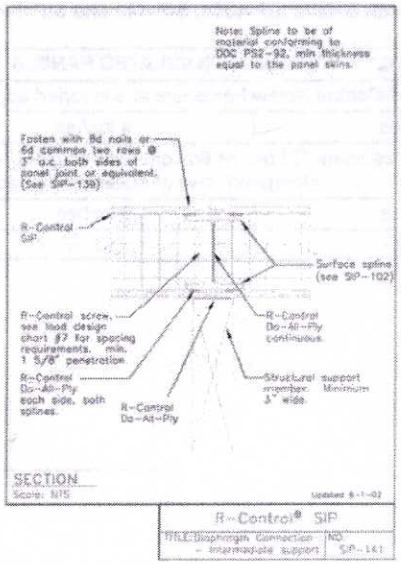
TABLE 9—ROOF/FLOOR-DIAPHRAGM LOADING[2]
(See connection details SIP-139a, SIP-140 and SIP-141)

R-CONTROL® STRUCTURAL INSULATED PANELS			
$^{7}/_{16}$-inch OSB Thickness	Spacing of R-Control Screw Fasteners at supported edges (minimum $1^{5}/_{8}$ inch penetration)		
	3 inches	4 inches	6 inches
	Spacing of spline fasteners (8d box or 6d common) at unsupported edges—top side of panel only—two staggered rows of fasteners on each side of joint.		
	3 inches	3 inches	3 inches
	850 plf[1]	750 plf[1]	500 plf[1]

[1]Spline is $^{7}/_{16}$-inch OSB × 4.
[2]See details SIP-139a, SIP-140, and SIP-141.







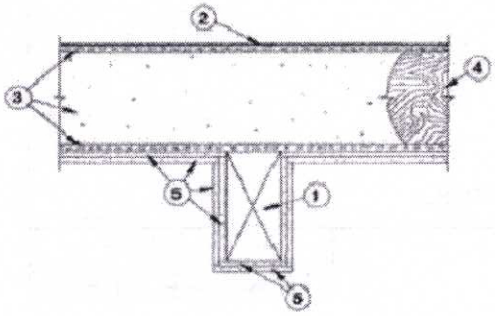


FIGURE 1
Restrained Assembly Rating - 1 hour
Unrestrained Assembly Rating - 1 hour

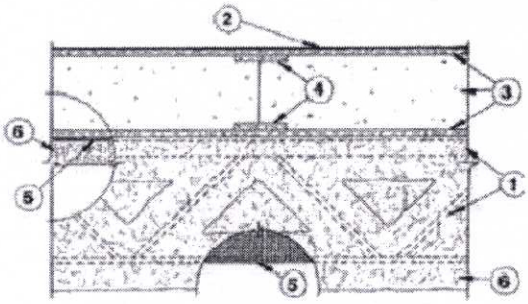


FIGURE 2
Restrained Assembly Rating - 1 hour
Unrestrained Assembly Rating - 1 hour

Refer to Section 4.4.3 for installation instructions

TABLE 10—MANUFACTURING LOCATIONS

LISTEE	LOCATION	PLANT ID NO.	PRODUCTS[1,2]
ACH Foam Technologies, LLC	5250 North Sherman Street Denver, Colorado 80216	U-1	EPS, SIP
ACH Foam Technologies, LLC	111 West Fireclay Avenue Murray, Utah 84107	U-2	EPS
ACH Foam Technologies, LLC	920 Kleppe Lane Sparks, Nevada 89431	U-53	EPS, SIP
ACH Foam Technologies, LLC	2731 White Sulphur Road Gainesville, Georgia 30503	U-4	EPS, SIP
ACH Foam Technologies, LLC	4001 Kaw Drive Kansas City, Kansas 66102	U-8	EPS
ACH Foam Technologies, LLC	1418 Cow Palace Road Newton, Kansas 67114	U-41	EPS
ACH Foam Technologies, LLC	90 Trowbridge Drive Fond Du Lac, Wisconsin 54936-0669	U-37	EPS
ACH Foam Technologies, LLC	809 East 15th Street Washington, Iowa 52353	U-55	EPS
ACH Foam Technologies, LLC	3751 Sunset Avenue Waukegan, Illinois 60087	U-57	EPS, SIP
ACH Foam Technologies, LLC	Maquiladoras #331 Int A y B Tijuana, Baja California Mexico	U-60	EPS
Big Sky Insulations, Inc.	15 Arden Drive Belgrade, Montana 59714	U-30	EPS, SIP
Branch River Plastics, Inc.	15 Thurber Boulevard Smithfield, Rhode Island 02917	U-6	EPS, SIP
Chapman Building Systems	5275 Highway 27 East Kerryville, Texas 78028	U-25A	SIP
Flexible Packaging Company	Bayamon Gardens Station, Bayamon Puerto Rico 00985	U-10	EPS, SIP
Knauf USA Polystyrene Inc.	2725 Henkle Drive Lebanon, Ohio 45036	U-58	EPS
Noark Enterprises, Inc.	10101 Highway 70 East North Little Rock, Arkansas 72117	U-24	EPS, SIP
Pacific Allied Products, Ltd.	91-110 Kaomi Loop Kapolei, Hawaii 96707	U-17	EPS
Poly-Foam, Inc.	116 Pine Street South Lester Prairie, Minnesota 55354	U-22	EPS
Team Industries, Inc.	326 McGhee Road Winchester, Virginia 22603	U-14	EPS, SIP
Team Industries, Inc.	4580 Airwest Drive SE Grand Rapids, Michigan 49512	U-12	EPS, SIP
Therma Foam, Inc.	2324 Franklin Drive Forth Worth, Texas 76106	U-25	EPS

[1]EPS products include R-Control® EPS Boards and R-Control® Perform Guard® EPS Boards.
[2]SIP products include R-Control® Structural Insulated Panels and R-Control® FIreResist® Structural Insulated Panels.

DESAI NASR
CONSULTING ENGINEERS

STRUCTURAL DESIGN CALCULATIONS
DNCE PROJECT NUMBER: 5634

ALOeTERRA

SOLAR DECATHLON 2007

DESIGN COMPETITION

ARCHITECT

Lawrence Technological University,
Southfield, MI

MARCH 2007

STATE OF MICHIGAN
ATHANACIOS N. NASR
ENGINEER
No. 30603
LICENSED PROFESSIONAL ENGINEER

TABLE OF CONTENTS

CONTENT		PAGE NUMBER
1.	Structural Design Criteria	1 - 2
2.	Pier Supports (Foundation)	3 – 5
3.	Supporting Beams	6 - 9
4.	Floor, Roof, & Walls	10

6765 DALY ROAD, WEST BLOOMFIELD, MI 48322 PHONE: (248) 932-2010 FAX: (248) 932-3088

DESAI NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield, MI
48322-4585
tel: 248 932 2010

Subject:	Project No.	5634
AloeTerra, Southfield	Sheet No.	1
	By:	MN
	Date:	March 2007

STRUCTURAL DESIGN CRITERIA

PROJECT LOCATION : Southfield, MI

GOVERNING BUILDING CODE : Michigan Building Code 2003.

STRUCTURAL DESIGN CODE : International Building Code 2003

ADDITIONAL STRUCUTURAL CODES AND DESIGN STANDARDS

1) STEEL DESIGN : AISC Steel Design Manual, 9th ed.
Steel Design Method : Allowable Strength Design

2) WOOD DESIGN : National Design Specifications for Wood Construction, 2001

5) FIBER GLASS DESIGN : Allowable Strength Design

MATERIAL PROPERTIES

STEEL

Miscellaneous shapes and plates : A36 Fy = 36 KSI

FIBERGLASS

Rectangular tubes-EXTREN 500 & 525 Fu = 30,000PSI
E = 2,600. KSI

SOIL

Allowable bearing capacity : fa = 1500 psf (AT WASHINGTON DC)
: fa = 3000 psf (AT SOUTHFIELD, MI)

SPECIAL INSPECTIONS:

Refer to applicable structural code for special inspection requirements.

DESIGN LOADS

1- LIVE LOAD:

i) Roof Snow Load:

a.	Ground Snow Load:	30 PSF
b.	Flat Roof Snow Load: (Minimum Roof Load):	25 PSF
c.	Snow Exposure Factor:	1.0
d.	Snow Load Importance Factor:	1.1
e.	Additional loading due to drifting at changes in roof elevations per applicable code.	

ii) Supported floors:

a.	All areas:	50 PSF

3- WIND LOAD:

i)	Basic Wind Speed (3-second gust):	90 MPH
iii)	Occupancy Category:	II
iv)	Wind Importance Factor:	1.15
v)	Exposure Category:	B
vi)	Internal Pressure Coefficient:	0.18
vii)	Wind Pressure :	15 psf

DESAI NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield MI
48322-4585
248.932.2010
Fax.932.3088

Subject	Project No.
ALO & TERRA	Sht. No. 3 of
	By
	Date

DESIGN OF SUPPORTING PIERS

* LOAD CAPACITY 2000 LBS/PIER

BASED ON 1500 PSF SOIL BEARING CAPACITY @ WASHINGTON D.C

* DESIGN LOADS

ROOF	L.L		20 PSF
	D.L SELF WT	3.8 *	
	SOLAR PANELS	4.0	
	ROOFING	1.0	
	CEILING	2.0	
	M/E	1.0	12 PSF
	TOTAL LOAD		32 PSF

FLOOR	L.L		50 PSF
	D.L SELF WT.	3.8 *	
	FLOORING	3.0	
	M/E	1.0	8 PSF
	TOTAL LOAD		58 PSF

* SELF WEIGHT OF SIP PANELS IS 3.8 PSF

DESAI NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield MI
48322-4585
248.932.2010
Fax.932.3088

Subject: ALO & TERRA

Project No.
Sht. No. 4 of
By
Date

* LOAD DESIGN @ EXTR PIERS ℄ ① & ③ & ④ AND ⑥

REFER TO S100 FOR LOCATIONS

TYPICAL BAY SIZE 3'-10" X 6'-8"

ROOF LOAD 7.75' X 3.67' X 32 PSF = 910.16

WALL LOAD 8' X 3.67' X 3.8 PSF = 111.57

FLOOR LOAD 3.3' X 3.67' X 58 PSF = 702.44

1724.17 LBS

LESS THAN 2000 LBS

OK

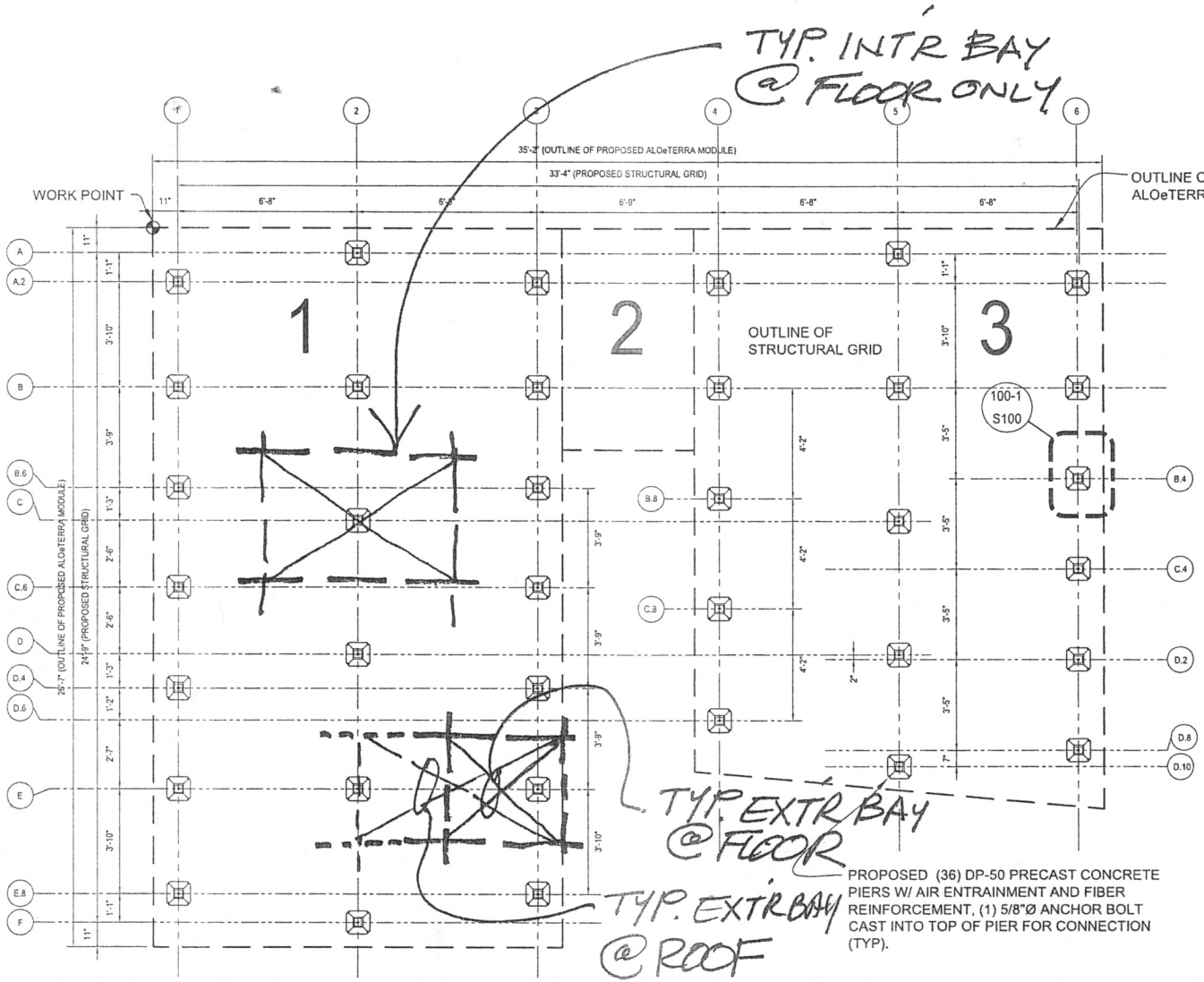
* LOAD DESIGN @ INTR. PIERS ℄ ② AND ⑤ (REF. TO S100)

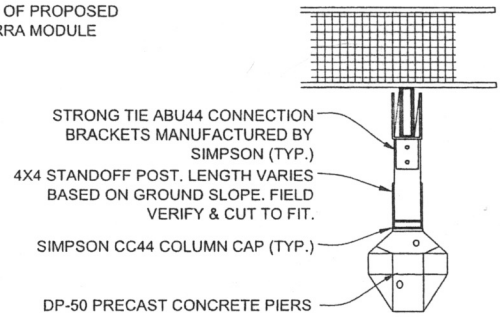
TYPICAL BAY SIZE 5'-0" X 6'-8"

FLOOR LOAD 5'-0" X 6.67' X 58 PSF = 1934.3 LBS

LESS THAN 2000 LBS

OK





100-1 S100 DP-50 DIAMOND PIER DETAIL
SCALE: 1"=1'-0"

NOTE:

SITE CONDITIONS CAN NOT BE PREDICTED. IN ORDER TO INSURE LEVEL FOUNDATION SHIMS WILL BE USED TO CORRECT ANY HEIGHT VARIANCES

general notes

1. Precast concrete w/ air entrainment and fiber reiforcement, (1) 5/8"Ø Anchor bolt cast into top of pier for connection.
2. Pins are (4)1" (nominal diameter) Schedule 40 galvanized pipe steel corrosion reistant. Cut driven 30".
3. Injection molded caps are placed over the exposed ends of the pins and prevent water penetration.
4. Soil bearing capacity (min.) = 1500psf
5. Pier capacity is 2000lbs.

product	design capacities	weight	seat	height	midpoint	quantity	total weight	cost
diamond pier dp-50	2000lb	50lbs	3.5"	10.5"	--"	36	1650lb	$20 ea
¼" bent metal bracket						36		

FOUNDATION PLAN
SCALE: 1/4"=1'-0"

Issued for	Date
DD Review	
DD Submission	
CD Review	
CD Submission	
CD Sign-off	

date JAN14/07
project number LTU_001
scale 1/4"=1'-0"
drawn NB
checked H.R.
drawing title FOUNDATION PLAN

//sheet number **S100**

DESAI NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield MI
48322-4585
248.932.2010
Fax.932.3088

Subject: ALO & TERRA

Project No.
Sht. No. 6 of
By
Date

DESIGN OF SUPPORTING BEAMS

* FOR BEAMS LOCATIONS REFER TO S101
* FOR BEAMS CAPACITIES REFER TO THE ATTACHED STRONGWELL LOAD TABLE FOR RECTANGULAR TUBE 6½ X ¼ X 2 X ½ (FIBER GLASS EXTREN 500 & 525)

BEAM B-1: (INTERIOR)

SPAN 5'-0"

LOAD 6.67 X 58 = 387 #LF

@ DEFLECTION $\delta = \frac{L}{360}$

CAPACITY = 544 PLF

ACTUAL DEFLECTION

$$= \frac{L}{360\left(\frac{544}{387}\right)} = \frac{L}{506}$$

δ = 0.12 IN.

O.K

DESAI / NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield MI
48322-4585
248.932.2010
Fax.932.3088

Subject	Project No.
ALO & TERRA	Sht. No. 7 of
	By
	Date

BEAM B-2: (EXTERIOR LONG SIDE)

SPAN 3'-10"

LOAD 7.75' X 32 #/□
8' X 3.8 #/□
3.3' X 58 #/□
= 470 PLF

* ATTACHED TABLE DOES NOT INCLUDE ≈ 4'-0" SPAN
ESTIMATED CAPACITY IS 972 PLF

OK

BEAM B-3: (EXTERIOR SHORT SIDE)

SPAN 6'-8"

LOAD 1.5 X 32 #/□
8 X 3.8 #/□
1.5 X 58 #/□

= 165 PLF

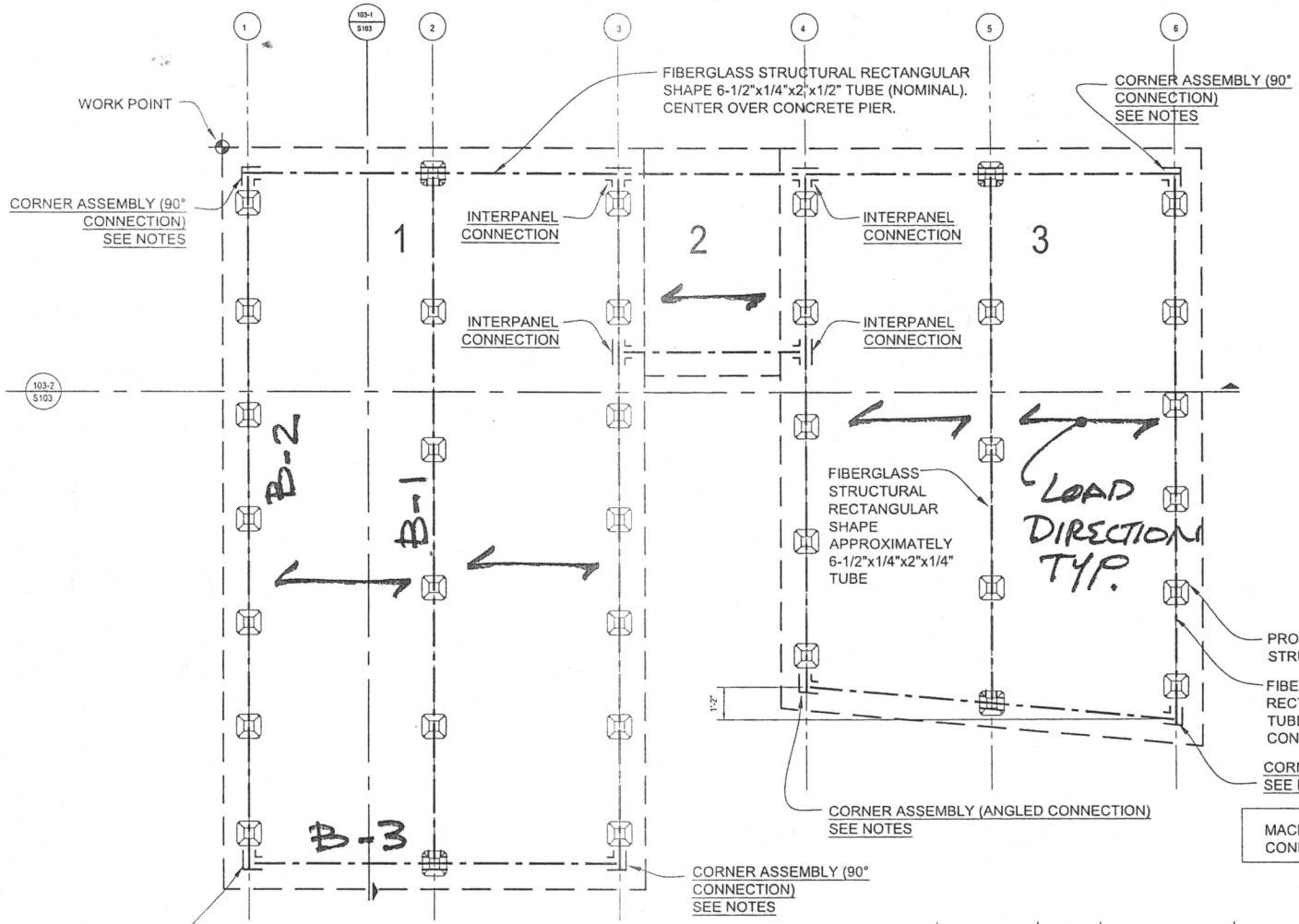
@ DEFLECTION $\delta = \frac{L}{360}$

CAPACITY = 232 PLF

ACTUAL DEFLECTION = $\frac{L}{505}$

δ = .016 IN.

OK



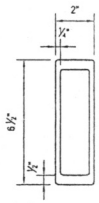
NOTE:
CONCRETE PIERS AT OUTSIDE CORNERS TO BE OFFSET FROM STRUCTURAL FRAME INTERSECTION IN ORDER TO CONNECT FIBERGLASS MEMBERS

CORNER ASSEMBLY (90° CONNECTION)
(1) 8"x8"x3/8" GALV. STL. ANGLES W/ (2) 3/4"Ø H.S. ANCHOR BOLTS EACH SIDE (TYP. AT (4) 90° FIBERGLASS FRAME INTERSECTIONS)
(1) 4"x4"x3/8" GALV. STL. ANGLES W/ (2) 3/4"Ø H.S. ANCHOR BOLTS EACH SIDE.

CORNER ASSEMBLY (ANGLED CONNECTION)
(1) 8"x8"x3/8" GALV. STL. ANGLES W/ (2) 3/4"Ø H.S. ANCHOR BOLTS EACH SIDE THIS CONNECTION ONLY

INTERPANEL CONNECTION
12"x6"x1/4" EXTERIOR GALV. STL. WASHER PLATE TYPICAL IN (4) LOCATIONS
(2) 4"x4"x3/8" GALV. STL. CLIP ANGLES W/ (2) 3/4"Ø H.S. ANCHOR BOLTS EACH SIDE. (4) LOCATIONS PER SET.

MACHINE DRILL ALL MECHANICAL CONNECTIONS. TYPICAL.



FIBERGLASS STRUCTURAL RECTANGULAR SHAPE

product	capacities	weight	dimensions	qauntity (lf)	total weight	cost	
extren fiberglass structural shapes			6-1/2"x1/4"x2"x1/2"	200.75 lf		$33 lf	
4"x4"x3/8" galv. stl. angles				12			
8"x8"x3/8" galv. stl. angles				4			
12"x6"x1/4" galv. stl. washer plate				8			
95° angle 8"x8"x3/8" galv. stl. angles				1			
95° angle 4"x4"x3/8" galv. stl. angles				2			
85° angle 8"x8"x3/8" galv. stl. angles				1			
85° angle 4"x4"x3/8" galv. stl. angles				2			
3/4"Ø high strength anchor bolts				92			

1 S101 FOUNDATION FRAMING PLAN
SCALE: 1/4"=1'-0"

ALOeTERRA
Solar Decathlon 2007
Lawrence Technological University

Issued for	Date
DD Review	
DD Submission	
CD Review	
CD Submission	
CD Sign-off	

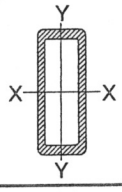
date JAN14/07
project number LTU_001
scale 1/4"=1'-0"
drawn NB
checked H.R.
drawing title FOUNDATION FRAMING PLAN
//sheet number S101

BEAMS

RECTANGULAR TUBES - EXTREN® 500 & 525

E = 2.6 x 10^6 psi F_U = 30,000 psi

Allowable Uniform Loads in Pounds Per Foot



	SPAN IN FEET	LATERALLY SUPPORTED - GOVERNED BY: Stress *F_b or F_v	Deflection l/100	l/150	l/180	l/240	l/360
4x1/8x2x1/4	5	564	403	269	224	168	112
Wt/ft. = 1.52 lbs.	6	454	247	165	137	103	69
b_f/t_f= 8.0	7	*334	161	107	89	67	45
F_b=11,100 psi	8	*256	110	74	61	46	31
A_w= 0.94 in²	9	*202	79	53	44	33	22
I_x= 4.41 in⁴	10	*164	58	39	32	24	16
S_x= 2.21 in³	11	*135	44	29	24	18	12
I_y=1.10 in⁴	12	*114	34	23	19	14	9
J= 2.64 in⁴							
6-1/2x1/4x2x1/2	5	1650	-	1307	1089	817	544
Wt/ft. = 3.77 lbs.	6	1375	1246	831	692	519	346
b_f/t_f= 4.0	7	1179	834	556	463	348	232
F_b=12,000 psi	8	*960	583	389	324	243	162
A_w= 2.75 in²	9	*759	422	281	234	176	117
I_x= 24.97 in⁴	10	*614	314	209	175	131	87
S_x= 7.68 in³	11	*508	240	160	133	100	67
I_y= 2.79 in⁴	12	*427	187	125	104	78	52
J = 8.02 in⁴	13	*364	149	99	83	62	41
	14	*313	120	80	67	50	33
	15	*273	98	65	55	41	27

** Non-stock size subject to mill run requirements.

DESAI / NASR
CONSULTING ENGINEERS
6765 Daly Road
West Bloomfield MI
48322-4585
248.932.2010
Fax.932.3088

Subject	Project No.
	Sht. No. 19 of
	By
	Date

DESIGN OF FLOOR & ROOF & WALLS

* STRUCTURAL INSULATED PANELS (SIP) SHALL BE USED TO CONSTRUCT THE FLOOR, ROOF AND WALLS OF THE PROJECT.

* SIP MFR./SUPPLIER SHALL PROVIDE ENGD DESIGN CALCULATIONS SIGNED AND SEALED BY P.E. @ STATE OF MI. FOR REVIEW AND APPROVAL PRIOR TO CONSTN.

SUMMARY OF CHANGES

This specification book includes the necessary instructions, materials, and quality requirements for the construction of the Solar Decathlon house. This Document has improved from its precursor as it is more in depth and includes the products and materials to be used for the project.

The following sections have been removed:

- Section 01 74 19, 1.4 “Related LEED Credits”
- Section 23 00 00, 1.2 “Related LEED Credits”
- Section 23 56 00, 1.2 “Related LEED Credits”
- Section 44 40 00, 1.4 “Related LEED Credits”
- Section 11 82 23, 1.2 “Related LEED Credits”
- Section 12 00 00, 1.2 “Related LEED Credits”
- Section 26 00 00, 1.2 “Related LEED Credits”

The following divisions/sections have been added:

- Section 05 10 00, 2.1, B “Aluminum trellis”
- Section 26 09 00 “Instrumentation and Control for Electrical Systems”
- Section 07 27 13 “Modified Bituminous Sheet Air Barriers”

Updated/Replaced:

- Structural Calculations as of July
- Section 06 51 13 Plastic Lumber replaced by Section 06 50 00 Structural Plastics

WATER INVENTORY

Type of Appliances	Amount of Water (gal) per Use	How Often?	Total Amount of Water (gal) for Week
Water Sitting in Pipes	9.79	1.00	9.79
80 gal Tank	80.00	1.00	80.00
Shower	15.00	10.00	150.00
Clothes Washer	8.20	4.00	32.80
Dishwasher	15.00	4.00	60.00
Toilet	1.60	28.00	44.80
26 gal tank	26.00	1.00	26.00
Pressure Tank	62.00	1.00	62.00
Faucets (2)	0.50	112.00	56.00
			Total = 521.39

Total amount of water required = 600 gallons

RECYCLING ESTIMATE

Beverage containers
MH cans
Metals
Paper
Cardboard
Wood
Ferrous? MH
Non-ferrus MH
Glass
EPS
Plastic
Paper
Will compost organic waste

SUMMARY OF UNLISTED ELECTRICAL COMPONENTS

- LM317 – 3-Terminal Adjustable Regulator: Sage Glass Voltage Regulator and Hinge:
  For a low-voltage PV stand-alone circuit powering the SageGlass windows in the entry doors.

MATERIAL SAFETY & DATA SHEETS (MSDS) WILL BE AT THE END OF EACH PRODUCT'S SECTION (WHERE REQUIRED)

Division 01: General Requirements

Section 01 20 00 – Price & Payment Procedures
Section 01 30 00 - Administrative Requirements
Section 01 35 43 – Environmental Procedures
Section 01 40 00 - Quality Requirements
Section 01 50 00 - Temporary Facilities & Controls
Section 01 60 00 - Product Requirements
Section 01 74 19 - Construction Waste Management & Disposal

SECTION O1 20 00 - PRICE & PAYMENT PROCEDURES O1 20 00-1

PART 1 – GENERAL

1.1 SUMMARY

This section includes the procedures for purchases and student reimbursement.

1.2 STANDARD PURCHASE PROCEDURE

A. Before a purchase is made, fill out the Request for Approval form located on the Blackboard website in the finance folder.
B. Turn in the form in the Solar Decathlon drop-box or by e-mail.
   1. The drop-box is located in Michelle Juras's office (A113)
   2. To submit the form by e-mail, copy the full-text of the form and paste it into the e-mail, or attach the file to the e-mail and send it to Phil Plowright at pplowright@ltu.edu. Send a copy of the e-mail to Lauren Yankovich at lyankovich@ltu.edu.
C. An e-mail will be returned to the sender notifying him/her if the item(s) has been approved.
   1. Only purchase approved items.
   2. Students will not be reimbursed for items that are not approved before purchase.
D. Once the purchase has been approved, fill out a Purchase Order form, including line item amounts and total cost. The university can not process a purchase order which does not include both line item and totals. Make sure to double check the address for both supplier and delivery. Put the Purchase Order request in Lauren Yankovich's box in Michelle Juras's office or email the completed digital form to Philip Plowright, pplowright@ltu.edu. The form will be put into the university purchasing system and a Purchase Order number (P.O) will be sent to the identified company, starting the order process. Please check with the company you are purchasing from within 10 days to make sure they received the P.O. number. Arrange any special delivery instructions at this time also.
E. Cash/personal purchase procedures for small dollar amount only. If you have purchased material out of your own pocket and it was an approved purchase, fill out the Check Request form located on the Blackboard website in the finance folder. If the reimbursement is for travel, also fill out the Travel Expense Report form. If the reimbursement is for mileage, also fill out the Mileage Report form located on the Blackboard website in the finance folder.
   1. Mileage reports are to be filled out for significant commuting only.
   2. Attach original receipts/invoices to the Check Request form.
   3. Be clear and descriptive when filling out forms.
F. Turn all necessary paperwork to the Solar Decathlon drop-box.
   1. Expect a minimum of three weeks before receiving reimbursement.

END OF SECTION 01 20 00

PART 1 – GENERAL

1.1 SUMMARY

This section includes information and procedures for shop drawings, product data, samples, survey data, and construction photographs.

1.2 PERFORMANCE REQUIREMENTS

A. Shop Drawings
   1. Shop drawings shall be ledger (11”x17”) size, and in the form of one (1) reproducible .dwg or .pdf file, and two (2) black & white prints or photocopies, which shall be checked and stamped and approved by Phil Plowright and Christina Snyder before start of construction.
B. Product Data
   1. For product data, submit sufficient manufacturer's catalog sheets and other descriptive data in the form of one (1) reproducible .pdf file, and two (2) black & white or color prints or photocopies required by owner.
C. Samples
   1. Submit one (1) physical sample for color selections to be made by owner/ architect. Samples shall be 12" x 12", unless otherwise indicated.
   2. Refer to AIA Document A201 "General Conditions" for more information.
D. Survey Data
   1. The owner must be responsible for properly laying out the work, lines and measurements for the work to be executed under the contract documents. Contractors must verify the figures before laying out the work and report errors or inaccuracies in writing to Larry Remlinger at harold@jonsarkesian.com and Phil Plowright at pplowright@ltu.edu before commencing work. The architect or his representatives will in no case assume the responsibility for laying out the work.
E. Construction Photographs:
   1. Contractor must document locations of all utilities in the walls before dry walling and any other code-critical work that is about to be concealed. Documenting work prior to its concealment does not relieve the contractor of his obligation to exhibit the unconcealed work to the architect and to the code official(s) having jurisdiction over the work, prior to any of the work being concealed. Construction photos are required in color. The size must be a minimum of a scan of a 4 x 6 print or 2 mega pixel digital image on stable media such as a CD-Rom (floppy disks are unstable). At the completion of all work, five final photographs shall be taken as directed by the architect.
   2. One copy of each photograph shall be e-mailed to the Owner / Architect. The prints of film photographs shall be neatly labeled, dated, and identified in a title box in the lower right-hand corner, showing the date of exposure, project name and location, and direction of view. When digital photographs are submitted, files shall be named indicating subject, and organized in folders and subfolders labeled to clearly indicate all of the above required information (including date taken); photo files may not be altered in any way.

END OF SECTION 01 30 00

PART 1 - GENERAL

1.1 SUMMARY

Overall project goals: The following environmental goals have been established for the project. These goals are general in nature; refer to specific specification sections for more detailed requirements. Notify Owner/ Architect if conflicts arise between performance of the work and environmental goals. This specification is not intended to limit alternative means of achieving these goals. Suggestions and input from the contractor(s)/manufacturers for implementing these goals are encouraged.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Material selection and construction process goals: In support of the overall goals listed above, the following goals have been identified for the material selection and construction process. These are also general in nature and should be considered as a guideline in the event of a conflict, any specific requirements in technical specification sections take precedence. Tradeoffs and compromises are inevitable in the pursuit of these goals, but everyone working on the project is expected to take all reasonable actions to further these goals. Notify Owner and Architect of any performance requirements that conflict unnecessarily with these goals.

B. Use resources efficiently:
   1. Reuse existing buildings and materials.
   2. Select materials that use resources efficiently.
   3. Use construction practices that achieve the most efficient use of resources and materials.
   4. Recycle or reuse job-site waste.
   5. Select recycled-content materials.
   6. Select materials that can be recycled.
   7. Avoid scarce, irreplaceable, or endangered resources.
   8. Select materials from abundant, well-managed resources.
   9. Select materials that are replaceable, renewable, or can be replenished.
   10. Select materials that minimize damage to natural habitats.

C. Use durable materials:
   1. Select materials with the longest usable life.
   2. Select materials that can be reused.
   3. Select materials with the least burdensome maintenance requirements.

D. Create spaces that are healthy for occupants:
   1. Select low-toxic products and materials.
   2. Select materials without toxic maintenance requirements.
   3. Specify mechanical equipment that will provide fresh air and will not trap water or pollutants.

E. Use energy efficiently:
   1. Select materials with low embodied energy.
   2. Select materials that save energy during building operations.
   3. Select products and equipment that save energy during building operations.
   4. Use water efficiently: Use construction practices that achieve the most efficient use of water.
   5. Select water-conserving appliances and equipment.
   6. Landscape for water conservation.
   7. Capture and utilize rainwater.
   8. Select materials that generate the least amount of pollution. Consider pollution and toxins generated during harvesting, mining, manufacturing, transport, installation, use, and disposal.
   9. Protect/restore natural habitats.

PART 3 – EXECUTION

3.1 ENVIRONMENTAL GOALS IMPLEMENTATION

A. Owner/Contractor shall designate an on-site party (or parties) responsible for instructing workers and overseeing the Environmental Goals for the Project.

B. Environmental Goals shall be discussed at the following meetings:
   1. Pre-bid meeting
   2. Pre-construction meeting
   3. Regular job-site meetings
C. Use resources efficiently in the construction, operation, and ultimately reuse or removal of the building should be optimized to eliminate unnecessary use of energy, water, and raw materials. As such, the building has been designed to:
   1. Require a minimum of imported, nonrenewable energy.
   2. Require a minimum of imported or mined water.
   3. Support occupant efforts to recycle and reuse materials.
   4. Be durable, consistent with expected current and future uses.
   5. Utilize materials and construction methods that require a minimum of energy, water, and raw materials.
   6. Be reusable and or recyclable in whole or in component parts.
D. Provide a healthy and productive indoor environment to the extent that the building can affect their experience, occupants should be enlivened, relaxed, and stimulated when they are in the building. To this end, the building has been designed to:
   1. Minimize the potential for water accumulation in conditions in which mold and mildew can flourish.
   2. Utilize daylight as a primary source of illumination, while minimizing glare and extreme contrast.
   3. Provide optimal amounts of clean, fresh air to occupied spaces.
   4. Release a minimum of unhealthy pollutants from building components, fixtures, and furnishings.
   5. Evacuate effectively any pollutants generated by occupant activities in the building.
   6. Provide views and experiences of nature.
   7. Provide an aural environment that is relaxing and supportive.
E. Enhance, restore, and protect the site; the insertion of the building into the site should support and enhance the natural systems on and around the affected area. To this end, the building, infrastructure, and landscaping have been designed to:
   1. Support and utilize natural water flow patterns and minimize the need for intrusive stormwater management systems.
   2. Minimize the release of harmful emissions into the soil, water, and air.
F. Enhance, restore, and protect the global environment the building is designed to minimize releases of pollutants that affect the global environment and to avoid the need for materials that are polluting to manufacture. These measures include:
   1. Minimizing the release of carbon dioxide (CO2) from fuels burned on site or fuels burned off site to supply electricity to the building
   2. Avoiding the release of ozone-depleting compounds, such as HCFCs from refrigerants or foam insulation materials
   3. Selection of building materials that, based on an overall life-cycle assessment, are the least damaging to the environment in their extraction, processing, use, and ultimate disposal

END OF SECTION 01 35 43

PART 1 – GENERAL

1.1 SUMMARY

A. Provide and maintain an effective Contractor Quality Control (CQC) program and perform sufficient inspections and tests of all items of work, including those of subcontractors, to ensure compliance with Contract Documents. Include surveillance and tests specified in the technical sections of the specifications. Furnish appropriate facilities, instruments, and testing devices required for performance of the quality control function. Controls must be adequate to cover construction operation and be keyed to the construction sequence.

PART 3 – EXECUTION

3.1 PROCEDURE

A. CONTROL OF ON-SITE CONSTRUCTION

Include a control system for the following phase of inspection:

1. Preparatory Inspection. Perform this inspection prior to beginning work on any definable feature of work. Include a review of contract requirements with the supervisors directly responsible for the performance of the work; check to ensure that provisions have been made for required control testing; examine the work area to ascertain that preliminary work has been completed; physically examine materials and equipment to ensure that they conform to shop drawings and data and that the materials and equipment are on hand.
2. Initialize Inspection. Perform this inspection as soon as work commences on a representative portion of a particular feature of workmanship; review control testing for compliance with contract requirements.
3. Follow-Up Inspections. Perform these inspections on a regular basis to ensure continuing compliance with contract requirements until compliance of that particular work.
4. Documentation of CQC Report. Identify the inspections hereinbefore specified and document in the CQC report with a brief description of the subject matter covered and the personnel involved.

B. QUALITY CONTROL ORGANIZATION

The Owner and the Architect will conduct independent Quality Control inspections which the contractors should be required to facilitate. Contractors would still be responsible for their own Quality Control, including the inspection of areas which are to receive their work to ensure all is ready to receive their work and notification of the Owner and Architect if other trades have not properly executed the work which is a prerequisite to a contractor's trade. Contractors also must supervise and demand quality of their workers during execution of the work, even if it means redoing portions, and should inspect the work themselves and make corrections prior to independent inspections by the Owner and Architect. Also, Contractors must keep Owner and Architect appraised of their schedule and any changes to it, such that the Owner, Architect and authorities having jurisdiction (AHJ) can plan to be present to inspect at critical times after the completion of most of the critical work and before the work is covered in an assembly so that it would become invisible/inaccessible.

C. TESTING LABORATORY

The contractor shall arrange for a testing laboratory to provide on-site/off-site services required in lieu of direct employment of personnel. The tests shall be documented and certified. All compliance inspections shall record both conforming and defective items with an explanation for the cause of rejection, proposed remedial action, and corrective actions taken. Individual reports will be required of each inspector and technician covering the feature that each is assigned.

D. SCHEDULE OF CQC PLAN

Furnish a schedule outlining the procedures, instructions, and reports to be used as follows:

1. Quality control organization, Qualifications of personnel, Authority and responsibility of personnel, Schedule of inspection personnel, test methods, and methods of performing and documenting quality control operations.

E. REPORTS

Inspection shall be recorded and submitted weekly certifying items correctly installed and items found to be defective with a statement on corrective measures taken.

F. TESTING AND INSPECTION DEVICES
Either the Contractor or his testing laboratory shall provide and maintain all measuring and testing devices, laboratory equipment, instruments, and supplies necessary to accomplish the required testing and inspection. All measuring and testing devices shall be calibrated periodically against certified standards.

G. TESTING AND INSPECTION REQUIREMENTS
Where technical sections of the specifications require inspection and testing by a testing laboratory, engage a reputable, recognized testing laboratory, experienced in the type of work to be performed. The representative of the testing laboratory shall be on the work site as necessary for sampling, inspection and testing in accordance with the Contract provisions. Submit written reports of results within 3 days after completion of tests.

H. LATEST DOCUMENTS
The Contractor's Quality Control system shall provide for procedures to ensure that the latest Contract Documents, shop drawings, and instructions required by the Contract are used for fabrication, testing, and inspection.

END OF SECTION 01 40 00

PART 1 - GENERAL

1.1 GENERAL

A. Owner/ GC will arrange for and provide temporary facilities and controls as specified herein and as required for the proper and expeditious prosecution of the work, and pay all costs, except as otherwise specified.

B. Make all temporary connections to utilities and services in locations acceptable to the Owner/ Architect, and local authorities having jurisdiction thereof; furnish all necessary labor and materials, and make all installations in a manner subject to the acceptance of such authorities and the Architect; maintain such connections; remove the temporary installation and connections when no longer required; restore the services and sources of supply to proper operating condition.

C. Owner will pay all costs for temporary electrical power, temporary water, and temporary heating.

1.2 TEMPORARY FENCE

A. Provide and maintain a temporary enclosure to secure the area at the job site and to guard and effectively close in the designated area. Provide gates at locations where required for access to the enclosed area. Gates shall be of substantial construction, cross-braced, hung on heavy strap hinges, and shall have suitable hasps and padlocks. Submit shop drawings of fence and gates for review of Architect and Owner. Paint the fence with two coats of an approved paint.

1.3 TEMPORARY FIELD OFFICES

A. Provide and maintain a field office with a telephone at the job site. In addition, provide a temporary office with not less than 200 ft' of space for the use of the Architect at the construction site. The Architect's office shall be complete. with light, heat, air-conditioning, toilet facilities, electric water cooler, plan racks, four-drawer metal file with lock, shelves for samples, tables, chairs, and janitor service. When it becomes possible to establish an office in the building, office accommodations of approximately the same size as those in the field offices, including the services above, shall be provided and maintained for the Architect until the issuance of a certificate of substantial completion. Field and temporary offices shall be removed when no longer required. Provide a telephone for the Architect and pay all charges for installation and calls, including long distance calls.

B. Construction shanties, sheds, and temporary facilities provided as required above, or for the contractor's convenience, shall be maintained in good condition and neat appearance, including painting with two coats of approved paint of a color selected by the Architect.

1.4 TEMPORARY HEAT AND VENTILATION

A. Provide temporary heat as required during construction to protect the work from freezing or frost damage, and as necessary to ensure suitable working conditions for the construction operations of all trades. In areas of the building where work is being conducted, the temperature shall be maintained as specified in the various sections of the specifications, but not less than 45°F Under no circumstances shall the temperature be allowed to reach a level that will cause damage to any portion of the work that may be subject to damage by low temperatures. .

B. Until the building, or any major portion thereof, is enclosed, temporary heating shall be by smokeless portable unit heaters of type listed by Underwriters' Laboratories, Factory Mutual, and the Fire Marshall. Pay for fuel, maintenance, and attendance required in connection with the portable unit heaters. Interior or exterior surfaces damaged by the use of these space heaters shall be replaced by new materials or be refinished.

C. The building shall be considered enclosed when it has reached the stage when exterior walls have been erected, the roof substantially completed, exterior openings closed up either by permanently glazed windows and doors or by adequate temporary closing, and the building is ready for interior masonry and plastering operations.

D. After the building, or any major portion thereof, has been enclosed, the permanent heating system as specified below may be used for temporary heat. e. When the permanent heating system, or a suitable portion thereof, is in operating condition, the system may be used for temporary heating, provided that

the Contractor (1) obtains approval of the Architect, (2) assumes full responsibility for the entire heating system, and (3) pays all costs for fuel, operation, maintenance, and restoration of the system.

E. Provide adequate ventilation as required to keep the temperature of the building within 10°F of the ambient outdoor temperature when such ambient temperature exceeds 70°F, and to prevent accumulation of excess moisture or to prevent excess thermal movement in the building.
F. When the permanent air circulation system, or a suitable portion thereof, is in operating condition, it may be used without refrigeration or chilling, provided that the Contractor (1) obtains approval from the Architect, (2) assumes full responsibility for the system that he is using, and (3) pays costs for power, operation, maintenance, and restoration of the system. Provide temporary filters to adequately filter air being distributed through the duct work to the supply outlets; disposable filters shall be placed in front of all exhaust registers to keep construction dirt out of exhaust duct work. The Contractor shall thoroughly clean the interior of the air handling units and duct work prior to acceptance of the work.
G. Upon conclusion of the temporary heating period, remove all temporary piping, temporary heating units, or other equipment and pay all costs in connection with repairing any damage caused by the installation or removal of temporary heating equipment. Thoroughly clean and recondition those parts of permanent heating and air circulation systems used for temporary service.

1.5 TEMPORARY LIGHT AND POWER

A. Make all arrangements with the local electric company for temporary electrical service to the construction site; provide all equipment necessary for temporary power and lighting; and pay all charges for this equipment, the installation thereof, and for current used. The electrical service shall be of adequate capacity for all construction tools and equipment without overloading the temporary facilities and shall be made available for power, lighting, and construction operations of all trades.
B. In addition to the electrical service, provide power distribution as required throughout structure of 120/208-V, three-phase, four-wire, 60-cycle ac. The terminations of power distribution shall be at convenient locations in the building. Terminations shall be provided for each voltage supply complete with circuit breakers, disconnect switches, and other electrical devices as required to protect the power supply system.
C. A temporary lighting system shall be furnished, installed, and maintained as required to satisfy minimum requirements of safety and security. The temporary lighting system shall afford general illumination in all building areas and shall supply not less than 1 W/ft' of floor area for illumination in the areas of the building where work is being performed.
D. All temporary equipment and wiring for power and lighting shall be in accordance with the applicable provisions of the governing codes. All temporary wiring shall be maintained in a safe manner and used so as not to constitute a hazard to persons or property.
E. When the permanent electrical power and lighting systems are in operating condition, they may be used for temporary power and lighting for construction purposes.
F. At the completion of the construction work all temporary wiring, lighting, and other temporary electrical equipment and devices shall be removed.

1.6 TEMPORARY STAIRS, LADDERS, RAMPS, RUNWAYS, ETC.

A. Provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, chutes, and so on, as required for the proper execution of the work. All such apparatus, equipment, and construction shall meet all requirements of the Labor Law and other state or local laws applicable thereto.
B. As soon as permanent stairs are erected, provide temporary protective treads, handrails, and shaft protection.

1.7 SECURITY

A. Provide sufficient watchman service to prevent illegal entry or damage during nights, holidays, or other periods when work is not being executed, and such other control watchmen as required during working hours.
B. Provide all temporary enclosures required for protecting the project from the exterior, for providing

passageways, for the protection of openings both exterior and interior, and any other location where temporary enclosures and protection may be required.

C. Take adequate precautions against fire; keep flammable material at an absolute minimum; and ensure that such material is properly handled and stored. Except as otherwise provided herein, do not permit fires to be built or open salamanders to be used in any part of the work.

1.8 WATER AND SNOW CONTROL

A. From the commencement to the completion of the work, keep all parts of the site and the project free from accumulation of water, and supply, maintain, and operate all necessary pumping and bailing equipment.

B. Remove snow and ice as necessary for the protection and prosecution of the work, and protect the work against weather damage.

1.9 BACK UP GENERATORS

A. Honda EU3000
   a. Engine: 6.5 HP, Single Cylinder, Overhead Valve, Air Cooled
   b. Displacement: 196 cc
   c. AC Output: 120V, 3000W max.(25A), 2800W rated (23.3A)
   d. Receptacles: 20A 125V Duplex NEMA Plug Number: 5-20P, 30A 125V Locking Plug NEMA Plug Number: L5-30P
   e. DC Output: 12V, 144W (12A)
   f. Starting System: Recoil, Electric
   g. Fuel Tank Capacity: 3.4 gallons
   h. Run Time on One Tankful: 7.2 hrs. @ rated load, 20 hrs. @ 1/4 load
   i. Dimensions (L x W x H): 25.8" x 18.9" x 22.4"
   j. Noise Level: 58 dB @ rated load, 49 dB @ 1/4 load
   k. Dry Weight: 134 lbs.

B. DuroPower DP7500EDS
   a. Engine: 9.0 HP, Single Cylinder, Air Cooled, Direct Injection, 4 Stroke Diesel Engine with Low Oil Shutoff.
   b. Displacement: 418cc
   c. AC Output: 120V, 7500W max. (30A), 6500W rated (27A)
   d. DC Output: 12V, (9.3A)
   e. Fuel Tank Capacity: 4.0 gallons
   f. Run Time on One Tankful: 7 hrs. @ rated load, 10 hrs. @ 1/2 load
   g. Dimensions: 39” x 24” x 33”
   h. Noise Level: 66dBA
   i. Gross Weight: 396 lbs.

C. OTHER:
   a. AC Circuit Breaker
   b. AC Socket
   c. Pilot Light
   d. Low Oil Alert ; including Low Oil Light
   e. 4 wheel dolly kit
   f. Fuel Gage
   g. Volt Meter
   h. Battery Tray

END OF SECTION O1 50 00

PART 1 - GENERAL

1.1 TRANSPORTATION AND HANDLING

A. Materials, products, and equipment shall be properly containerized, packaged boxed, and protected to prevent damage during transportation and handling. b. More detailed requirements for transportation and handling are specified under the technical sections.

1.2 STORAGE AND PROTECTION

A. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
B. Available storage space at the job site is limited to the site shown on the Drawings. Allocate such space for storage purposes. Any additional off-site space required is the responsibility of the Contractor.
C. Allocate the available storage areas and coordinate their use by the trades on the job. Maintain a current layout of all storage facilities.
D. Store and protect materials delivered at the site from damage. Do not use damaged material on the work.

1.3 INSTALLATION REQUIREMENTS

A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise specified.

1.4 IDENTIFYING MARKINGS

A. Name plates and other identifying markings shall not be affixed on exposed surfaces of manufactured items installed in finished spaces.

1.5 PRODUCT APPROVAL STANDARDS

A. Definitions
   1. The term "product" shall include material, equipment, assembly methods, manufacturer, brand, trade name, or other description.
   2. References to approved equal or similar terms mean that approval of the Architect is required.
B. Proof of Compliance. Whenever the Contract Documents require that a product be in accordance with federal specification, ASTM designation, ANSI specification, or other association standard, the Contractor shall present an affidavit from the manufacturer certifying that the product complies therewith. Where requested or specified, submit supporting test data to substantiate compliance.
C. Inclusion in Specifications of Non-specified Products Prior to Bid Date. For inclusion of products other than those specified, Bidders shall submit a request in writing at least 10 days prior to bid date. Requests received after this time will not be reviewed or considered, regardless of cause. Requests shall clearly define and describe the product for which inclusion is requested. Inclusion by the Architect will be in the form of an addendum to the Specifications issued to all contract bidders on record.
D. Substitutions after Award of Contract
   1. Substitution of products will be considered after award of contract only under one of the following conditions:
      a. When the specified product is not available, a proposed substitution will not be considered unless proof is submitted that firm orders were placed within ten (10) days after review by the Architect of the item listed in the Specifications or the unavailability is due to a strike, lockout, bankruptcy, discontinuance of the manufacture of a product, or natural disasters.
      b. When a guarantee of performance is required and, in the judgment of the Contractor, the specified product or process will not produce the desired results.

A. Request for such substitution shall be made in writing to the Architect within ten (10) days of the date that the Contractor ascertains he cannot obtain the material or equipment specified, or that the performance cannot be guaranteed.
B. Procedures Respecting Substitution
   1. The Contractor shall accompany any request for substitution with such drawings, specifications,

samples, manufacturer's literature, performance data, and other information necessary to describe and evaluate the proposed substitution completely. The burden of proof shall be on the Contractor.

2. Permission to make any substitution after award of contract shall be effected by a Change Order. It shall not relieve the Contractor, any subcontractor, manufacturer, fabricator, or supplier from responsibility for any deficiency that may exist in the substituted product or for any departures or deviations from the requirements of the Contract Documents as modifies by such Change Order. Except as otherwise expressly specified by the Contractor in his request for substitution and expressly approved in such Change Order, the Contractor shall be deemed to warrant by his request that the proposed substitute product will satisfy all standards and requirements satisfied by the originally specified product and the Change Order shall not be deemed to modify the Contract Documents with respect thereto.
3. If any substitution will affect a correlated function, adjacent construction or the work of other trades or contractors, the necessary changes and modifications to the affected work shall be considered as an essential part o the proposed substitution, to be accomplished by the Contractor without additional expense to the Owner if and when accepted.

END OF SECTION 01 60 00

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Construction waste accounts for between 25% and 35% of materials going into our landfills.
B. A new home typically generates over 4 pounds of waste per square foot and in a recent waste characterization study of a new, developer home in California, the figure was 12 pounds per square foot. Clean wood, concrete, and cardboard make up the majority of new construction waste but are highly recyclable. Recommendations are to have a contract with a recycling contractor and provide a Waste Management Plan to reduce and recycle construction waste. Separate and recycle construction materials.

1.2 WASTE MANAGEMENT GOALS FOR THE PROJECT

A. The Owner has established that this Project shall minimize the creation of construction and demolition waste on the job site. [Contributing factors include over-packaging, ordering error, poor planning, improper storage, breakage, mishandling, and contamination.] Recycle as many of the waste materials as economically feasible. Minimize waste sent to landfills.
B. Diversion Goals: A minimum of 70% of total project waste shall be diverted from landfill. The following waste categories, at a minimum, shall be diverted from landfill:
   1. Clean dimensional wood, pallet wood
   2. Plywood, OSB, and particleboard
   3. Cardboard, paper, packaging
   4. Metals
   5. Gypsum drywall (unpainted)
   6. Paint
   7. Glass
   8. Plastics
   9. Beverage containers

1.3 RESOURCES

A. WasteSpec, Triangle J Council of Governments, PO Box 12276, Research Triangle Park, NC 27709; www.tjcog.dst.nc.us/cdwaste.htm
B. U.S Environmental Protection Agency's C&D Debris Web pages: www.epa.gov/epaoswer/non-hw/debris/
C. AIA Masterspec Section 01524, ARCOM, 332 East 500 South, Salt Lake City, UT 84111-3309; 800-424-5080, www.arcomnet.com

1.4 RELATED SECTIONS

A. Section 02050 - Demolition/Dismantling/Salvage

1.5 SUBMITTALS

A. Waste Management Plan: Prior to any waste removal, the Contractor shall submit to the Owner a Waste
B. Management Plan. The Plan shall contain the following:
   1. Designation of the party who will implement the plan
   2. Analysis of the estimated job-site waste to be generated, including types and quantities (use Appendix A - Waste Material Estimating Sheet)
   3. Proposed Alternatives to Landfilling: a list of each material planned to be salvaged or recycled during the course of the Project and the proposed destination of each material (use Appendix A - Waste Material Estimating Sheet)
   4. Progress Reports: Submit [monthly], [quarterly], [at end of job], a Waste Management Progress Report. The report shall contain the following information:
   5. Project title, name of company completing report, and dates of period covered by the report
   6. Amount (in tons or cubic yards) of material landfilled from the Project and identity of the landfill

C. For each material recycled or salvaged from the Project, provide the following:
   1. Amount (in tons or cubic yards)
   2. Date(s) removed from the job site
   3. Receiving party
   4. Cost: Bin rental, hauling, and facility fees
   5. What was done with the material
D. Include legible copies of on-site logs, manifests, weight tickets, and receipts. Manifests shall be from recycling and/or disposal site operators who can legally accept the materials for the purpose of reuse, recycling, or disposal.

1.6 PROJECT MEETINGS
A. Waste management plans and implementation shall be discussed at the following meetings:
   1. Pre-bid meeting
   2. Pre-construction meeting
   3. Regular job-site meetings

PART 2 – PRODUCTS/SERVICES
2.1 PRE-QUALIFIED CONSTRUCTION WASTE RECYCLING SERVICES
A. Qualified local recycling organizations

2.2 RECYCLING EQUIPMENT
A. Granger mobile recycle receptacles will be placed on site for organized recycling.
   1. Model No: 2my42, Capacity 50 Gal, Flat Dome Hinged Top, Material Plastic, Color Blue, Length 29 in, Width 23 1/2 In, Height 36 3/4 in, 8 in Non-marking Rubber Wheels
B. The receptacles will be labeled as follows:
   1. One (1) labeled as “Cardboard”
   2. Two (2) labeled as “Plastic”
   3. One (1) labeled as “Organic”
   4. One (1) labeled as “Paper”
   5. One (1) labeled as “Metal”
C. Materials are to be placed in the appropriately labeled receptacles only.

PART 3 - EXECUTION
3.1 WASTE MANAGEMENT PLAN IMPLEMENTATION
A. Coordinate waste materials handling and separation for all trades, and document results of the Waste Management Plan. Provide separation, handling, transportation, recycling, salvage, and landfilling for all demolition and waste materials. Designate a specific area for separation of material for salvage and recycling. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination or mixing materials. Maintain an on-site log, which includes for each load of materials removed from site: type of material, load volume and/or weight, recycling/hauling service, date accepted by recycling service or landfill, and facility fee. Use Appendix B - Landfill Log and Appendix C - Waste Diversion Log. Do not handle, separate, store, salvage, or recycle hazardous materials with other materials. Follow material-specific instructions any hazardous materials. Contact Project Manager if no instructions are evident.

END OF SECTION 01 74 19

SECTION 02 05 19 - UNIT PAVING 02 05 19-1

PART 1 – GENERAL
1.1 SUMMARY
A. All materials used for temporary “paving” of paths shall comply with the requirements of the National Park Service for protection of the grass, and shall be installed the minimum length of time necessary to protect the grass from pedestrian and vehicular traffic, in order to permit photosynthesis.

PART 2 – PRODUCTS
1.2 MATERIALS
A. Temporary Protection Boards per the requirements of the National Park Service. Rubber or plastic mats for driving the car onto the site will be a maximum 4’-0” x 4’-0”.

END OF SECTION 02 05 19

Division 05: Metals

Section 05 10 00 - Structural Metal Framing
Section 05 40 00 - Cold-Formed Metal Framing

SECTION 05 10 00 - STRUCTURAL METAL FRAMING 05 10 00-1

PART 1 - GENERAL
1.1 SUBMITTALS
A. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content. (75% post-consumer steel is a good minimum to ask for).

1.2 ENVIRONMENTAL CONSIDERATIONS
A. Use high-recycled-content steel (reduces pollution, conserves resources and energy).
B. Use most efficient section, lightest weight using the least amount of steel for the application (conserves resources).
C. Use salvaged structural steel (conserves resources).
D. Use steel from nearest available source (conserves transportation energy).

1.3 ENVIRONMENTAL QUALITY ASSURANCE
A. Select highest-percentage recycled steel available.

PART 2 - MATERIALS
2.1 PRODUCTS
A. Horizontal and Vertical Loads:
1. Bearing plates at lifting cables for lifting house modules.
2. Temporary spreader bars for lifting the house modules.
B. Aluminum trellis:
1. 6” x 2” x 1/8” Tubes
2. 1 ½” x 1 ½” x 1/8” Angles
3. 2” x 2” x 1/8” Angles
4. 2 ½” x 1/8” Flat stock
5. 2” x 1/8” flat stock

PART 3 - EXECUTION
3.1 INSTALLATION
A. Where feasible, use bolted connections to allow for disassembly and reuse.

3.2 WASTE MANAGEMENT
A. Collect off-cuts and scrap and place in designated areas for recycling.

END OF SECTION 05 10 00

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Use high-recycled-content steel (reduces pollution, conserves resources and energy).
B. Provide thermal insulation covering the framing (conserves energy, prevents condensation).

1.2 SUBMITTALS

A. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.

PART 2 - MATERIALS

2.1 STEEL FRAMING

A. L-shaped, galvanized, drywall exterior corner beads of size, shape, and gauge as recommended by manufacturer. Include manufacturer's standard accessories, including runners, tracks, clips, stiffeners, and bracing, of highest recycled content available.

2.2 RELATED MATERIALS

A. Fasteners: Provide screws as recommended by manufacturer.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT

A. Collect metal cutoffs and scrap; place in designated area for recycling.

END OF SECTION 05 40 00

Division 06: Wood and Plastics

Section 06 05 73 – Wood Treatment
Section 06 10 00 – Rough Carpentry
Section 06 12 16 – Stressed Skin Panels
Section 06 20 23 – Interior Finish Carpentry
Section 06 50 00 – Structural Plastics

SECTION 06 05 73 - WOOD TREATMENT 06 05 73-1

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Choose least toxic treatment (avoids pollution, protects biodiversity).
B. Choose most durable treatment (conserves resources).
C. Use smallest possible amount of chemicals (avoids pollution, protects biodiversity, conserves resources).
D. Use mechanical and other barriers (termite shields, termite mesh, sand barriers) to prevent infestation and reduce the requirement for wood treatment.
E. Specify stainless steel or hot-dip galvanized fasteners with ACQ or copper azole wood treatments.
F. Use nonthreatened, rot-resistant wood species instead of treated wood when possible.

1.2 SUBMITTALS

A. Product Data: Submit product data on wood preservative materials, including application instructions.

1.3 CODES AND STANDARDS

A. Obtain approvals from Building Official for alternative wood preservative treatment.

1.4 ENVIRONMENTAL QUALITY ASSURANCE

A. Preservative shall be adequately fixed in the wood. Reject lumber with surface residues of white salts. Wood that is kiln-dried after treatment and/or prefinished with a sealer is preferable.

PART 2 - PRODUCTS

2.1 PEST AND ROT CONTROL

A. ACQ - Ammoniacal copper quarternary compound: [Pressure-injected wood does not contain arsenic or chromium and is not classified as hazardous waste by EPA. Due to copper toxicity to aquatic organisms, it is not recommended for use near bodies of water.]
   1. Above ground: 0.25 lbs. retention/cu. ft.
   2. Ground contact: 0.40 lbs. retention/cu. ft.
B. CDDC: Copper hydroxide sodium dimethyldithiocarbamate [CDDC-treated wood is more completely fixed than CCA- and ACQ-treated wood and contains less metal per cubic foot of wood. Analysis of American Wood Preservers' Association leaching tests of CDDC-, CCA-, and ACQ-treated samples have shown 1%, 12%, and 10% losses, respectively.]
C. Boron-based preservative: Limited to above-ground use, but has Nonrestrictive handling requirements, low mammalian toxicity.

PART 3 - EXECUTION

3.1 APPLICATION: Per manufacturer’s instructions.

3.2 WASTE MANAGEMENT

A. Do not burn scraps of treated wood. Do not mix treated wood scraps with untreated wood. Hazardous wastes shall be separated, stored, and disposed of according to local regulations.
B. With wood products and wastes treated with CCA or other compounds containing chromium or arsenic, avoid disposal by incineration.

END OF SECTION 06 05 73

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Use FSC-certified wood products from well-managed forests (protects habitats, conserves resources).
B. Use salvaged wood (preserves old-growth timber, conserves resources).
C. Use engineered wood products (efficient use of resources).
D. Avoid old-growth timber and wood from threatened species (preserves biodiversity).
E. Choose least toxic wood treatment (reduces pollution, protects habitats).
F. Maximize framing efficiency (conserves resources).
G. Minimize job-site waste (conserves resources, diverts materials from landfill).
H. Select lowest grade that meets performance requirements. Avoid new dimensional lumber of cross-sectional area larger than 24" square e.g., 4x6, 2x12. (Tight-grained, clean, large cross-section lumber is often from old-growth sources.)

1.2 RESOURCES

A. Builder's Guides by Joe Lstiburek and Betsy Pettit (four separate volumes by climate type), Building Science Corporation (www.buildingscience.com); now available through Energy and Environmental Building Association (www.eeba.org)
B. Efficient Wood Use in Residential Construction, Natural Resources Defense Council
C. Forest Stewardship Council, www.fscoax.org
D. Specifying and Using Certified Wood, Certified Forest Products Council, www.certifiedwood.org

1.3 INDOOR AIR QUALITY

A. Protect framing from moisture during construction. Allow framing to dry before enclosing, to reduce conditions favorable to growth of mold. Construct vapor-permeable construction assemblies to allow moisture to escape.
B. Avoid wood products containing urea-formaldehyde binders (most interior-grade plywood, particleboard, medium-density fiberboard). Avoid interior use unless surfaces have been sealed. For individuals with chemical sensitivities, test proposed products before installation. Aromatic woods may also cause problems for individuals with chemical sensitivities.

1.4 SUBMITTALS

A. Submit product data on wood preservative materials, including application instructions.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect framing lumber, sheathing, and engineered wood products from excessive humidity and moisture. Store wood I-beams and glue-laminated beams and joists on edge.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Certified Dimensional Lumber: FSC-certified
B. Salvaged Lumber: from our demolition work, or from trees killed by ash borer beetle.
C. Engineered Wood Products:
   1. Glue-laminated dimensional lumber: Laminated-strand lumber for beams, posts, studs
   2. Glue-laminated beams: Laminated-strand lumber for perimeter beams
   3. Wood I-beams: Joists
D. Sheet Materials:
   1. Oriented-strand board (OSB):
   2. Structural fiberboard sheathing: Manufactured from 100% post-consumer newsprint
   3. Medium-density fiberboard: Formaldehyde-free, manufactured with PMDI binders
   4. Particleboard: Straw-based particleboard: Manufactured with PMDI binders
A. Structural insulated panels (SIPs): OSB skin bonded to expanded polystyrene core

B. Rot- and Insect-Resistant Wood:
   1. Untreated, naturally rot-resistant, heart wood (including, but not limited to, redwood, western red cedar, bald cypress, longleaf yellow pine, elm, black locust, American chestnut) from either FSC-certified or Salvaged source.
   2. ACQ Pressure-treated wood: Above-ground: 0.25 lbs. retention/cu. ft., Ground contact: 0.40 lbs. retention/cu. ft.

2.2 RELATED MATERIALS

A. Fasteners (highest recycled-content steel available): For ACQ or copper azole use only stainless steel or thick hot-dip galvanized coatings on steel fasteners.
B. Construction Adhesives: Water-based, maximum VOCs: 15 grams/liter
C. Building Felt: Minimum 30% recycled fiber content
D. Sill Sealer: Foam sill sealer to match width of sill plate

END OF SECTION 06 10 00

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes Structural insulated panels
   1. R-Control Panels are pressure laminated composites of approved oriented strand board (OSB) and AFM Certified Perform Guardª expanded polystyrene (EPS) insulation, manufacturer supplied connecting splines and approved fasteners.

B. SYSTEM DESCRIPTION:
   1. Performance Requirements: Provide structural insulated panels which have been manufactured, fabricated and installed to withstand loads [Specify code/standard reference.] and to maintain [Specify performance criteria.] performance criteria stated by manufacturer without defects, damage or failure.

1.2 ENVIRONMENTAL CONSIDERATIONS

A. Maximize insulation value to conserve energy. Select recycled-content materials to conserve resources. Avoid foams expanded with hydrochlorofluorocarbons (HCFCs). Select insulations that do not contain formaldehyde.

1.3 RELATED SECTIONS

A. Lumber and Carpentry: Division 6 Carpentry Sections

1.2 SUBMITTALS

A. GENERAL: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.
B. PRODUCT DATA: Submit product data, including manufacturer's SPEC-DATAª product sheet, for specified products.
C. CODE COMPLIANCE: Provide evidence of compliance with code requirements as an alternate method of construction. Submit current compliance report numbers from ICBO, BOCA, SBCCI and other regulatory agencies
D. CALCULATIONS: Each R-Control project shall be accompanied with verified structural calculations by a registered architect or professional engineer qualified to perform such work.
E. SHOP DRAWINGS: Submit shop drawings showing layout, profiles, product components and accessories
F. SAMPLES: Submit selection and verification samples for finishes and textures as required
G. QUALITY ASSURANCE SUBMITTALS: Submit the following:
   a. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties. Manufacturer shall certify that panels have been tested in accordance with ASTM E72, ASTM E119, ASTM E84, and other applicable tests
   b. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria, and physical requirements. Manufacturer shall supply a hard copy product certificate showing compliance to Third Party Quality Control.
   c. Manufacturer's Instructions: Manufacturer's installation instructions and construction detail book
   d. Manufacturer's Field Reports: Manufacturer's field reports specified herein
H. CLOSEOUT SUBMITTALS: Submit the following:
   a. Warranty: Warranty documents specified herein

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Installer should be experienced in performing work of this section and should have specialized in installation of work similar to that required for this project
B. Regulatory Requirements: [Specify applicable requirements of regulatory agencies
C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section

D. Use aged and settled values for thermal resistance factors (R-values), tested in accordance with ASTM C518 at 75° F and 50% relative humidity for at least 6 months.

1.4 TESTING AND INSPECTIONS

A. Correct defects, such as voids, gaps before accepting work.
B. Conduct blower door test to verify that air tightness of building envelope is better than 0.2 air changes per hour at 50 Pascal's.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Sections
B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays
C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact
D. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer
    a. R-Control panels shall be fully supported in storage and protected from weather. Cover stored panels with tarps or similar protective wraps. Panels shall be stored in a protected area and supported to prevent contact with the ground.
    b. Prior to installation, panels shall be covered and protected from exposure to sunlight and moisture

1.6 RELATED SECTIONS

A. Section 07 92 00 - Joint Sealants

1.7 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions
B. Manufacturer's Warranty: Submit manufacturer's standard warranty document. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents

PART 2 - PRODUCTS

2.1 PRODUCTS

A. STRUCTURAL INSULATED PANELS:
    1. Panels: R-Control Structural Insulated Panel, a pressure laminated panel consisting of the following
        a. Perform Guard expanded polystyrene core - minimum of 0.95 pcf (15.2 kg/m3) AFM Certified EPS complying with ASTM C578 (other densities may be specified). Insulation manufacturer must provide certification of Third Party Inspection and Listing as an AFM Certified EPS manufacturer
        b. OSB - shall be identified on the panel with an APA or TECO performance rating mark with an Exposure 1 durability rating; minimum physical properties shall be tested and meet PS 2
        c. Adhesives - shall be an R-Control Building Systems approved laminating adhesive having an in-use temperature range of -40 to +250 degrees F (-40 to -121 degrees C).
    2. Splines for use in joining panels shall be supplied by panel manufacturer
    3. Fasteners: #14 corrosion resistant R-Control Screws for roof, corners and attachment of panel to frames. In addition, zinc galvanized screws, nails or staples for spline and plate attachments. Fasteners as supplied or approved by panel manufacturer following fastening requirements
    4. Adhesive/Sealant: Do-All-Ply for installing accessories and dimensional lumber shall be supplied by panel manufacturer and installed per R-Control Details
    5. Foam Sealant: A sealant compatible with each component of panel and adjacent materials
    6. Dimensional Lumber: SPF #2 or better or pre-engineered equivalent supplied by the contractor
    7. Thermal Barrier: AFM Firefinish[a] or approved equal shall be installed on the interior of R-Control Panels

as required by the local building code

B. Structural Testing: Each panel type shown on drawings shall meet or exceed performance standards when tested in accordance with the following methods:
   1. Compressive Load Test Method: ASTM E72, Transverse Load Test Method: ASTM E72, Concentrated Load Test Method: ASTM E72, Racking Load Test Method: ASTM E72, Diaphragm Testing Test Method: Modified ASTM E72, Combined Axial and Bending Test Method: Modified ASTM E72, Header Testing Test Method: APA Large Scale, Long Term Cold Creep Under Load Test Method: ASTM E72, Tension Testing Test Method: ASTM C297, Impact Testing Test Method: ASTM E695, Accelerated Aging Test Method: ASTM D1183C, Termite Resistance Test: Manufacturer's standard test, Tested values shall meet or exceed those stated on manufacturer's load design charts and applicable technical data reports.

C. Fire Testing: Panel with approved finishes shall have successfully passed the following fire tests as conducted by testing agencies approved and listed by the model code. In addition, panel must be listed in current UL Directories, Sections BLBT, BXUV, BZXX and QRSY
   1. UBC 17-5, Room Corner Burn Test; ASTM E119, 20 minute with 3 story load applied for duration of the test; ASTM E119, One hour with 3 story load applied for the duration of the test followed by hose stream; ASTM E119, One hour Roof/Ceiling with design load applied for the duration of the test; ASTM E119, (small scale) 20 minute and one hour wall exposures with openings; ASTM E84, Surface Burning Characteristics conducted for the rigid insulation core; ASTM E84, Surface Burning Characteristics conducted for the interior and exterior surfaces of the finished panel.

D. Wind Uplift: Calculated for recommended fastening of roof panels by a certified engineering professional

2.2 MATERIALS

A. Structural insulated panels with EPS expanded polystyrene core: Use densities above 3 lb/sq. ft. , and as high a recycled content as possible (15% recycled content is common, up to 60% recycled content is available). Use FSC certified oriented strand board (OSB) or plywood faces. R-values of walls shall be at a minimum of R-55 (preferred value of R-60). R-values of the roof shall be a minimum of R-60 (preferred value of R-65).
   a. R-Values: 10 1/4" (260 mm); [Specify R-value.] [37 ft2•h•°F/Btu (7 m2•K/W) at 75 degrees F (24 degrees C)][40 ft2•h•°F/Btu m2•K/W) at 40 degrees F (4 degrees C)].

2.3 SOURCE QUALITY

A. Source Quality Assurance: Each panel component required shall be supplied by panel manufacturer and shall be obtained from selected manufacturer or its approved supplier
   a. Each panel shall be labeled indicating the maintenance of in-plant Quality Control/Third Party Inspection Service in compliance with national codes.
   b. Provide evidence of third party inspection and labeling of all insulation used in manufacture of panels. Both flame and physical characteristics shall be covered by manufacturer's Quality Control and Listing programs.
   c. Panel manufacturer shall provide Lamination, R-Value and termite resistance warranty documents for building owner acceptance and execution. Manufacturer's standard forms will be submitted.
   d. Provide panels with Perform Guard termite resistant EPS. Treatment shall be EPA registered with treatment efficacy substantiated by independent research and ongoing in-plant testing.
   e. Dimensional Tolerance - shall comply with values listed in the manufacturer's Quality Control Manual.

B. Source Quality: Obtain structural insulated panels from a single manufacturer

2.4 ACCESSORY MATERIALS

A. Acoustical Caulk: Low-VOC

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions
   a. Verify conditions of substrate, grade and other conditions which affect installation of panels. Any adverse conditions shall be reported in writing. Do not proceed with installation until adverse conditions are corrected

3.2 INSTALLATION

A. Comply with Manufacturer's product data.
B. Wherever possible, use I-joist connectors in place of dimensional lumber to connect joints (a nominal dimension of 10in thickness SIP panel is required). Spray-Applied foam or caulk may be used between joints for air-tight seals. Radiant Barriers: Maintain airspace facing radiant barrier. Install and connect SIP panels as directed by the respective manufacturers, unless otherwise specified.
C. Protect SIPs, framing, and sheathing from moisture during delivery, installation, and use.
   Engineered Wood Joists: [Spacing and/or span may be increased beyond that allowed for same-depth dimensional lumber.]
   1. Protect from damage and moisture during delivery, installation, and use.
   2. Use care in lifting and carrying minimal strength in flat orientation.
   3. Protect engineered wood I-joists from fire; wood I-joists have lower fire resistance than dimensional lumber.
D. Sheathing: Protect material from damage and moisture during delivery, installation, and use.
   Structural Insulated Panels: Follow manufacturer's instructions for installation.
   1. Use finger-jointed studs for top and bottom plates for straightness and ease of installation.
   2. Protect OSB skins from damage and moisture during delivery, installation, and use.
   3. Provide horizontal and vertical raceways for electrical wiring.
   4. Avoid placement of DWV piping in stress skin panels.
E. Structural Insulated Panel Installation
   1. Panel Supports: Provide level and square foundations or floors that support wall panels. Hold sill plate back from edge of rim board 7/16" (11 mm) to allow full bearing of OSB skins. Provide 1 1/2" (38 mm) diameter access holes in plating to align with electrical wire chases in panels. Provide adequate bracing of panels during erection. Remove debris from plate area prior to panel placement.
   2. Panel Fastening: Connect panels by nails or staples and Do-All-Ply adhesive/sealant. Screws of equal strength may be substituted for nails and staples when used at an equivalent frequency. R-Control Do-All-Ply must be used together with each fastening techniques. When R-Control Screw Fasteners are used, provide a minimum of 1" (25.4 mm) penetration into support. Join R-Control panels using plates and splines. Secure attachment with nails, staples, or screws, and Do-All-Ply. Provide R-Control Do-All-Ply adhesive/sealant. Apply Do-All-Ply in a 1/4" (6 mm) x 1/8" (3.2 mm) bead to wood surfaces. Size bead shall result in optimum coating when plates and splines are installed following manufacturer recommendations.
   3. Provide R-Control Do-All-Ply when sealing joints in contact with EPS foam insulation. Apply Do-All-Ply in a 3/8" x 3/8" (5 x 10 mm) bead where shown in R-Control details. When properly applied, R-Control Do-All-Ply shall augment overall tightness of structure.
   4. Thermal Barriers: Interior surfaces of R-Control panel shall be finished with a minimum 15-minute thermal barrier, such as 1/4" (4 mm) gypsum wallboard, Firefinish or nominal 1" (25 mm) wood paneling. Apply code approved thermal barriers according to manufacturer's recommendations.
   5. Vapor Retarders: Provide vapor retarders mandated by building code. Provide a vapor retarder, such as 6 mil (0.006") (0.15 mm) polyethylene on panel applications which are connected using methods other than surface splines.

6. Restrictions: Do not install panels directly on concrete. Do not put plumbing in R-Control panels without consulting panel manufacturer. Do not overcut skins for field-cut openings and do not cut skins for electrical chases.
7. Remove and replace insulated wall or roof panels which have become excessively wet or damaged before proceeding with installation of additional panels or other work.

3.3 WASTE MANAGEMENT

A. Plan and coordinate the insulation work to minimize the generation of off cuts and waste. Reuse insulation scraps to the maximum extent feasible. Separate and recycle waste materials in accordance with the Waste Management Plan and to the maximum extent economically feasible.
B. Separate wood waste in accordance with the Waste Management Plan. Separate the following categories for salvage or reuse on site:
   1. Sheet materials larger than 2 sq. ft.
   2. Framing members larger than 16"
   3. Multiple offcuts of any size larger than 12"
C. The following categories may be reused in the manufacture of particleboard or medium-density fiberboard:
   1. Composite wood (for example, plywood, OSB, LVL, I-joist, parallel-strand, laminated-strand, MDF, particleboard)
   2. Clean dimensional lumber
D. Set aside damaged wood for acceptable alternative uses; for example, use as bracing, blocking, cripples, or ties.
E. Do not burn lumber that is less than a year old.
F. Separate the following categories for disposal and place in designated areas for hazardous materials: Treated, stained, painted, or contaminated wood
G. Sequence work to minimize use of temporary HVAC to dry out building and control humidity.

3.4 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer’s instructions prior to owner’s acceptance. Remove construction debris from project site and legally dispose of debris

3.5 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction
   a. Roof panels: Protect roof panels from weather by roofing materials to provide temporary protection at the end of the day or when rain or snow is imminent.
   b. After installation, cover panels to prevent contact with water on each exposed panel edges and faces.

technical bulletin
eps no. 1008

subject: High Strength EPS
date: December 2004

EPS is a unique product that can be manufactured in a wide range of densities and strengths. Most commonly EPS is supplied in a density range from 0.9-2.4 lbs/ft³. The performance properties of EPS in this density range are covered by industry standard ASTM C578. However, some applications require higher strength than covered by ASTM C578.

R-Control EPS can be manufactured to custom high strength performance levels for application subjected to high load conditions. Examples of high strength EPS properties are shown below:

High Density R-Control EPS Properties[1]		40 PSI	50 PSI	60 PSI
ASTM C578 Type		XIV	——	——
Compressive Strength @ 10% def., min., psi (kPa)		40 (276)	50 (345)	60 (414)
Density, min., lb/ft³ (kg/m³)		2.4 (38.4)	2.7 (43.2)	3.0 (48.0)
Design Thermal Resistance per 1.0 in. thickness °F ft² h/Btu (°C m²/W)	40° F 75° F	4.76 (0.84) 4.35 (0.77)	4.76 (0.84) 4.35 (0.77)	4.76 (0.84) 4.35 (0.77)
Thermal Resistance, min., per 1.0 in. thickness °F ft² h/Btu (°C m²/W)	40° F 75° F	4.60 (0.81) 4.20 (0.74)	4.60 (0.81) 4.20 (0.74)	4.60 (0.81) 4.20 (0.74)
Flexural Strength, min., psi (kPa)		60 (414)	70 (483)	80 (552)
Water Vapor Permeance of 1.0 in. thickness, max., perm		2.5	2.5	2.5
Water Absorption by total immersion, max., volume%		2.0	2.0	2.0
Oxygen Index, min., volume%		24.0	24.0	24.0

[1] When tested in accordance with ASTM C578 Test Methods.

Note: Contact your local R-Control EPS supplier for availability of custom high strength R-Control EPS

AFM® Corporation 211 River Ridge Circle #102 Burnsville, MN 55337 Phone 800 255 0176 Fax 952 474 2074
www.r-control.com

END OF SECTION 06 12 16

PART 1 - GENERAL

1.1 SUBMITTALS

A. Certificates: Submit certification from an independent certification organization accredited by the Forest Stewardship Council certifying that wood comes from an independently certified, well-managed forestry source.

1.2 INDOOR AIR QUALITY

A. Some engineered wood products made with interior glues contain urea-formaldehyde. Do not use wood products containing urea-formaldehyde binders, or seal all surfaces. Aromatic woods may off-gas and cause problems for individuals with chemical sensitivities.

B. Machining plastic products produces hazardous dust. Protect surrounding areas from dust. Wear appropriate protection.

1.3 ENVIRONMENTAL CONSIDERATIONS

A. Select FSC-certified wood products (protects habitats, conserves resources).

B. Select salvaged wood products and casework (conserves resources).

C. Specify "knotty" and "character-grade" woods whenever possible to avoid unnecessary impact on forest resources.

D. Avoid products containing urea-formaldehyde binder.

E. Use engineered wood products (efficient use of resources).

F. Avoid plastic surfacing materials (avoids pollution).

PART 2 - PRODUCTS

2.1 INTERIOR MILLWORK

A. Base, Casing, Trim, Interior Rail and Wall Caps, and Miscellaneous Millwork:

B. Materials suitable for clear finish:

1. FSC-certified, solid dimensional lumber
2. Laminated bamboo
3. Salvaged, remilled lumber

C. Materials suitable for opaque finish: Medium-density fiberboard (MDF): Formaldehyde-free, pre-primed

D. Recycled paper: Slurried waste paper formed into moldings, blocks, or panels

E. Veneer Panels:

1. Substrate: either Formaldehyde-free MDF, or Strawboard (Particleboard made from straw with PMDI binders)
2. Veneers: FSC-certified

2.2 EXTERIOR MILLWORK - Fascia, Siding, Fencing, Decking, Lattice and Miscellaneous Trim

A. Dimensional lumber:

1. Rot-resistant species such as redwood, cedar, black locust, elm, chestnut, or other locally available, rot-resistant species
2. FSC-certified
3. Salvaged lumber

2.3 CASEWORK

A. Carcasses and Substrates:

1. Salvaged carcasses and cabinets: Seal interior surfaces.
2. Medium-density fiberboard: Formaldehyde-free
3. Straw particleboard
4. FSC-certified plywood

B. Solid dimensional lumber: FSC-certified

C. Face Frames, Doors, Drawers:

1. Salvaged doors and drawers

2. Solid dimensional lumber: FSC-certified or salvaged

D. Veneers: FSC-certified wood

2.4 COUNTERTOPS

A. Recycled-Glass Concrete: Cast concrete made from Portland cement, sand, and recycled-glass aggregates

B. Synthetic Cast Slabs:

1. Cast, lightweight material containing fly ash, polypropylene fibers, nontoxic synthetic resins, and recycled inert materials
2. Cast, terrazzo-like material containing waste marble chips, recycled plastic, and plastic or Portland cement binder

C. Stone:

1. Salvaged stone tiles or slabs
2. Locally quarried stone

D. Recycled-Plastic Solid Surfacing: Minimum 60% post-industrial waste

2.5 ADHESIVES

A. Interior Woodwork and Millwork: Low-VOC, FS MMM-A-125C, Type II, water- and mold-resistant. B. Use ASTM D3110, dry-use type for laminated and finger-jointed members, certified in accordance with ASTM C557 and complying with required VOC regulations.

1. Water-based contact cement
2. Water-based construction adhesive

C. Exterior Millwork: ANSI/HPMA HP 1983, Type I, air-cure waterproof type. Use ASTM D3110, wet-use type for laminated and finger-jointed members.

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT

A. Separate wood waste in accordance with the Waste Management Plan.

B. Separate the following categories for salvage or reuse on site:

1. Sheet materials larger than 2 sq. ft.
2. Solid wood trim longer than 16"
3. Multiple solid wood off-cuts of any size larger than 12"

C. Recycle the following categories:

1. Clean, unpainted engineered wood products
2. Clean, unpainted dimensional lumber

D. Place in designated areas for hazardous materials: Treated, stained, painted, or contaminated wood

PART I: PRODUCT IDENTIFICATION

Product:

Raw PureBond particleboard, decorative hardwood plywood with cores of veneer, PureBond particleboard, wheatstraw, certain no-added-formaldehyde medium density fiberboard or certain no-added-formaldehyde particleboard core assemblies laminated with Columbia's proprietary, formaldehyde-free resin systems.

Synonyms: Hardwood plywood and strawboard, NAF (No added formaldehyde) plywood

Trade Names: PureBond™, JayCore™ KayCore

Manufacturer: Columbia Forest Products
Corporate Office
222 SW Columbia, Suite 1575
Portland, OR 97201
1-800-547-4261
www.columbiaforestproducts.com

Contact: Emergency phone: Ang Schramm, Technical Services Manager
334-616-7745

PART II: HAZARDOUS INGREDIENTS

Component: CAS No.: **Wood dust**[1] (Generated as waste by-product of further fabrication by user)
Exposure limits: None

	PEL	STEL
ACGIH TLV Softwoods and most hardwoods (except Beech, and Oak)	5 mg/m³ TWA (15 min)	10 mg/m³
ACGIH TLV Certain Hardwoods (i.e. Beech and Oak)	1 mg /m³ TWA	N/A
OSHA All soft and hard woods (except Western Red Cedar)	5 mg/m³ TWA	10 mg/m³
OSHA Western Red Cedar	2.5 mg/m³ TWA	N/A

PART III: PHYSICAL PROPERTIES

Description: Solid wood flooring and hardwood veneers, unfinished and UV Finished multi-ply composite wood panels consisting of various combinations of hardwood or decorative veneer faces, bonded to other wood veneers or strawboard using adhesives containing no added formaldehyde. Generally used in cabinets, furnishings, flooring, and in other non-structural applications. Typically provided as solid wood strip flooring, 50"X100" lay-on hardwood veneers, and 4' X 8' hardwood panels. Other dimensions of hardwood plywood and veneers are available. Thickness of products range from 1/42" of an inch to over 1".

Specific gravity: Usually less than 1, but varies depending on wood species and moisture content.
Boiling point: Not applicable.
Solubility in water: Insoluble.
Appearance/Odor: Normal for natural wood. Light to dark in color. Color and odor vary by species and expired time since processing.

PART IV: FIRE AND EXPLOSION DATA

Flash point: 600° F for wood.
Autoignition temp.: Varies (typically 400° F to 500° F)
Explosive limits in air: N/A for hardwood plywood. 40 g/m3 (LEL) for wood dust.
Extinguishing media: Water, carbon dioxide, sand
Special fire fighting procedures: Follow established procedures for extinguishing wood source fire.
Unusual fire and explosion hazard: Hardwood plywood does not present an explosion hazard. Sawing, sanding, or machining of hardwood plywood can produce wood dust as a by-product which may present an explosion hazard if a dust cloud contacts an ignition source. An airborne concentration of 40 grams of wood dust per cubic meter of air is often used as the LEL for wood dust.

PART V: REACTIVITY DATA

Stability: Stable under normal conditions.
Incompatibility: Avoid contact with strong oxidizing agents and drying oils. Avoid open flame. Product may ignite at temperatures in excess of 400° F, depending on length of time of exposure.
Hazardous decomposition products: Thermal and/or thermal oxidative decomposition of wood can produce irritating and toxic fumes and gases, including carbon monoxide, hydrogen cyanide, aldehydes, organic acids, and polynuclear aromatic compounds.
Conditions to avoid: Avoid open flames or other ignition source.
Storage: In a cool, dry place, away from ignition sources. Provide adequate ventilation.

PART VI: HEALTH AND HAZARD DATA:

Eye contact: Wood dust can cause mechanical irritation.
Skin contact: Wood dust from various species of wood may evoke allergic contact dermatitis in sensitized individuals.
Ingestion: Not likely to occur.
Inhalation: Wood dust may cause nasal dryness and/or irritation. Coughing, sneezing, wheezing, sinusitis, prolonged colds, and headaches have also been reported. May aggravate preexisting respiratory conditions or allergies. Wood dust may cause nasal obstruction.
Chronic effects: Depending on species, wood dust may cause dermatitis on prolonged, repetitive contact. Wood dust may cause respiratory sensitization and/or irritation. Pre-existing respiratory disorders may be aggravated by exposure.

Prolonged exposure to wood dust has been reported by some observers of European furniture workers to be associated with nasal cancer. IARC classifies wood dust as a carcinogen to humans (Group 1). This classification is based primarily on IARC's evaluation of increased risk in the occurrence of adenocarcinomas of the nasal cavities and paranasal sinuses associated with exposure to wood dust. IARC did not find sufficient evidence to associate cancers of the oropharynx, lung, lymphatic, and hematopietic systems, stomach, colon, or rectum with exposure to wood dust. The National Toxicology Program (NTP) has also listed wood dust as a known human carcinogen. Wood dust is not listed as a carcinogen by ACGIH or OSHA. A large case control nasal cancer mortality study in North Carolina, Mississippi, Washington and Oregon (1962-1977) did not demonstrate an association between nasal cancer and occupations normally associated

with wood dust.

PART VII: PRECAUTIONS AND SAFE HANDLING

Ventilation: Provide adequate ventilation and exhaust to keep airborne contaminant concentration levels below the OSHA PELs.

Personal protective equipment:: Wear goggles or safety glasses when manufacturing or machining any wood product. Wear NIOSH/MSHA approved respirator when the allowable limits may be exceeded. Other protective equipment, such as gloves and outer garments may be needed, depending on dust conditions.

Fire prevention: Avoid open flames or other ignition sources. Keep fire extinguisher readily available.

PART VIII: EMERGENCY AND FIRST AID PROCEDURES

Eyes: Flush with large amounts of water. Remove to fresh air. If irritation persists,seek medical attention.

Skin: Wash affected area with soap and water. If rash, persistent irritation, or dermatitis occurs, seek medical attention.

Inhalation: Remove to fresh air. Get medical advice if persistent irritation, severe coughing, or breathing difficulty occurs.

Ingestion: Not applicable.

PART IX: SPILL, LEAK, STORAGE, AND DISPOSAL

Pick up, vacuum, or sweep spills for recovery and/or disposal. Avoid creating dusty conditions. Provide good ventilation where dust conditions cannot be avoided during cleanup. Place recovered wood dust in a container for proper disposal. Dispose in accordance with Federal, State, and Local regulations. Disposal is the responsibility of the generator.

PART X: KEY TO COMMONLY USED ACRONYMS

ACGIH: American Conference of Government and Industrial Hygienists
EPA: Environmental Protection Agency
HUD: US Department of Housing and Urban Development
IARC: International Agency for Research on Cancer
LEL: Lowest explosion limit
Mg/m^3: Milligrams per cubic meter
MSDS: Material Safety Data Sheet
NTP: National Toxicology Program
OSHA: Occupational Safety and Health Administration
PEL: Permissible exposure limit
PPM: Parts per million
STEL: Short term exposure limit
TLV: Threshold limit value
TWA: Time weighted average

PART XI: USER RESPONSIBILITY

Important: This information is offered in good faith. It is believed to be accurate and has been compiled from sources believed to be reliable. It is offered for your consideration, investigation, and verification. Columbia Forest Products makes no warranty of any kind, expressed or implied, concerning the accuracy or completeness of the information and data herein. Furthermore, Columbia Forest Products will not be liable for claims relating to any party's use of, or reliance on information and data contained herein, regardless of whether it is claimed that the information and data are inaccurate, incomplete, or otherwise misleading.
It is the responsibility of the user to comply with local, state, and/or federal regulations concerning the storage, use, processing, and disposal of the product or subsequently generated waste. It is the responsibility of the user to ensure that this MSDS is the most current version.

IMPORTANT FOOTNOTE[1]

CONCERNING OSHA PELS FOR WOOD DUST

In AFL-CIO v. OSHA 965 F. 2d 962 (11th Cir. 1992), the court overturned OSHA's 1989 Air Contaminants Rule, including the specific PELs for wood dust that OSHA had established at that time. The 1989 PELs were: TWA - 5 mg/m^3; STEL (15 min.) 10.0 mg/m^3 (all soft and hard woods except Western red cedar); Western red cedar TWA-2.5 mg/m^3.

Wood dust is now officially regulated as an organic dust under the Particulates Not Otherwise Regulated (PNOR) or Inert or Nuisance Dust categories at PELs noted under PART II of this MSDS. However, a number of states have incorporated provisions of the 1989 standard in their state plans. Additionally, OSHA has announced that it may cite companies under the OSH Act General Duty Clause under appropriate circumstances for non-compliance with the 1989 PELs.

END OF SECTION 06 20 23

PART 1 – GENERAL

1.1 GENERAL

A. The material composition for the decking and guardrail system is approximately 40% of virgin HDPE (High Density Polyethylene) and 60% of natural cellulose-based fiber (rice husks). Additional additives such as coupling agents, coloring and UV stabilizers are added to improve the physical properties (structural strength and impact resistance) and provide different stable colors. The XTENDEX products are manufactured by a continuous extrusion process in accordance with the manufacturer's Quality Control manual, producing engineered hollow profiles comparable to conventional sawn lumber-sized profiles.

B. Use outside (some plastics off gas).

1.2 DEFINITIONS

A. Purified: Has undergone processing to remove contaminants
B. Non-purified: Has not undergone processing to remove contaminants
C. Commingled: Combining several types of plastic
D. Composite: Plastic with other materials (sawdust, cellulose, etc.)
E. Reinforced: Plastic lumber reinforced with a structural core
F. HDPE: High-density polyethylene
G. LDPE: Low-density polyethylene

1.3 QUALITY ASSURANCE

A. Where consistency is required, use purified plastic of a single type (typically HDPE).

1.4 SUBMITTALS

A. Product Data: Submit a complete list of plastic lumber materials proposed for use, together with manufacturer's technical and mechanical properties data, including chemical composition, sources of plastic and other materials, percentage recycled content (post-industrial and post-consumer), and installation instructions.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Plastic Lumber: Minimum 90% recycled content; manufactured lumber and shapes created by melt processing. The lumber and shapes shall be manufactured from any resin or blend of resins with added compounding materials such that the quality of the finished product complies with this specification.

1. Solid sections
2. Hollow sections

B. Resins: Sources include but are not limited to:

1. Purified HDPE
2. Nonpurified HDPE
3. Multiple melt flow (PE): HDPE and LDPE
4. Commingled plastics

C. Additional characteristics as required by specific intended use. Provide ASTM test results for selected characteristics, such as:

1. Moisture absorption
2. Weathering
3. Density: ASTM D6111-97
4. Compressive strength: ASTM D6108-97; ASTM D6112-97
5. Tensile strength
6. Flexural modulus: ASTM D6109-97; ASTM D6112-97
7. Shear strength
8. Coefficient of thermal expansion
9. Screw withdrawal: ASTM D6117-97

10. Flash point

D. The 5/4 Decking System is a board with 4 hollow cavities and grooved beveled edges. The grove allows for the use of XTENDEX or E-Deck Hold Down Clips and provides for invisible fasteners. The 5/4 boards are 1 1/4 inch thick and 5 3/8 inch wide. The deck is finished by using an XTENDEX or E-Deck Edge Trim to cover the cavity openings and grooves around the edge of the deck. The 5/4 board can also be used for a stair tread with stringers spaced not more than 12 inches on center.

2.2 DURABILITY

A. 5/4 Decking Board maximum uniform live load (130 degrees F): 60psf and 100 psf where supported at a maximum of 16 inches.
B. XTENDEX abd E-Deck 5/4 Deck boards have an uplift capacity of 80 psf.
C. XTENDEX and E-Deck Decking Systems have been tested in accordance with:
    1. ASTM D1413-76
    2. ASTM D3345-74
    3. ASTM G 155-00

2.3 SURFACE BURNING CHARACTERISTICS

A. XTENDEX and E-Deck Decking systems were tested for surface burning characteristics under ASTM E 84 and demonstrated a flame spread index (FSI) of 104 and smoke development index (SDI) of 1597.

2.4 SURFACE BURNING CHARACTERISTICS

A. XTENDEX and E-Deck Decking Systems were tested for surface burning characteristics under ASTM E 84 and demonstrated a flame spread index (FSI) of 104 and a smoke development index (SDI) of 1597.

2.5 COEFFICIENT OF FRICTION

A. XTENDEX and E-Deck Decking Systems were tested in accordance with ASTM D2394:
    1. Fine Grain Deck Material: Leather sole static coefficient of friction dry: .0359 and .396, Leather sole static coefficient of friction wet: .405 and .552. Rubber sole static coefficient of friction dry: .604 and .813. Rubber sole static coefficient of friction wet: .58 and .701.
    2. Wood Grain Deck Material: Leather sole static coefficient of friction dry: .3 and .379, Leather sole static coefficient of friction wet: .376 and .499. Rubber sole static coefficient of friction dry: .346 and .568. Rubber sole static coefficient of friction wet: .411 and .582.
    3. Wood Deck Material: Leather sole static coefficient of friction dry: .723 and .721, Leather sole static coefficient of friction wet: .891 and .859. Rubber sole static coefficient of friction dry: .884 and .944. Rubber sole static coefficient of friction wet: .842 and .902.

2.6 RELATED MATERIALS

A. Fasteners: Square-head screws, deep-flight screws, bolts
B. Deck Fasteners: Slotted clips allow for expansion and contraction. Follow manufacturer's recommendations.
C. Adhesives: As recommended by manufacturer; VOC content not to exceed limits prescribed by California's South Coast Air Quality Management District

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall comply with the manufacturer’s published instructions and this report. The manufacturer’s published installation instructions shall be made available to the code official upon request, and shall be available on the job site during construction.
B. Use standard woodworking tools; carbide tips, coarse saw blades, and routers with aggressive cutters are recommended.
C. Allow adequate spacing between boards. Allow for lengthwise expansion and contraction (Plastic lumber expands and contracts more than comparable wood lumber). If available from the manufacturer,

use a clip system for installing deck boards that allows boards to move along their length.

D. Provide adequate support for plastic lumber used for decking, retaining walls, and other structural applications (Plastic lumber has a lower modulus of elasticity than wood). Follow manufacturer's recommendations, and provide engineering calculations if required by Building Official. High temperatures decrease modulus of elasticity and may cause members to sag or fail if not adequately supported.
E. Screws or bolts are recommended for fastening. If nails are used, use ring shank or spiral shank nails.
F. Plastic lumber cannot be painted. Some composite plastic lumber can be painted.
G. Plastic lumber can be repaired by melting. Follow manufacturer's recommendations for repair.

3.2 INSTALLATION

A. Before you begin:
    1. Check local building code requirements.
    2. Confirm intended use as Residential Outdoor Construction.
    3. Obtain local building code permit.
    4. Use Code-compliant standard wood frame construction.
    5. If using ACQ or CA treated wood frame, use manufacturer ’s recommended type of stainless steel or hot dip galvanized (G185) joist hangers, cross-backing or deck frame lateral support.
    6. Use steel or wood cross-backing for deck and frame lateral support.
    7. Follow safety precautions. Use gloves, goggles and respirator y protections. Use extreme caution with all power tools. Inhalation of dust particles is potentially harmful to your health.
    8. Follow the detailed instructions provided by installation guide.
    9. Obey the requirements of the latest occupational health and safety act regulation for construction projects where applicable.
B. Lay the first decking board onto a deck at the house or at the rim joist and mark locations for all concealed fasteners above the ledger or rim joist spaced maximum 16” O.C. all along the board’s length. Drill 3/8” dia. Hole through the upper wall of decking board for the screw access. Then pre-drill 7/64” dia. pilot holes through the bottom wall for all fasteners. Use #8 – 1 ¼” S/S deck screws to fasten the first board to a ledger or joist. Then use 3/8” dia. Plastic plugs to plug the holes through the upper wall.
C. Place XTENDEX HOLD DOWN CLIPS acting also as 3/16” spacers against the side of the first board at each deck support or joist spaced not more than 16” O.C. and screw them down with #6 – 1 ½” S/S fasteners. Do not tighten the screws fully yet. Based on your deck configuration identify location of fixed (pinned) connection per manufacturer’s installation instructions.
D. Place the second board tightly in position under the hold down clips against first board, install hold down clips against second board as per instruction in paragraph above and then tighten the hold down clip screws between first and second board snug.
E. Continue in the same manner with hold-down clip fastening towards the other end pinning each individual board as described in section 2. Fasten the last board again as per recommendation for the first board above.
F. Do not trim the boards individually but at the same time referring to expansion and contraction gap requirements as per manufacturer’s instructions.

3.3 WASTE MANAGEMENT

A. Set aside offcuts to be returned for recycling into new product. Place in designated area or provide for delivery to collection point.

END OF SECTION 06 50 00

Division 07: Thermal & Moisture Protection

Section 07 20 00 – Thermal Protection
Section 07 27 13 – Modified Bituminous Sheet Air Barriers
Section 07 41 00 – Metal roof and Wall Panels
Section 07 54 00 – Thermoplastic Membrane Roofing
Section 07 62 00 – Sheet Metal Flashing and Trim
Section 07 65 00 – Flexible Flashing
Section 07 92 00 – Joint Sealants
Sill Seal Gasket

SECTION 07 20 00 – THERMAL PROTECTION 07 20 00-1

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Maximize insulation value (conserves energy).
B. Select recycled-content materials (conserves resources).
C. Avoid foams expanded with hydrochlorofluorocarbons (HCFCs).
D. Select insulations that do not contain formaldehyde.
E. Avoid contact with standard fiberglass insulation (classified by EPA as a "probable" carcinogen).
F. Avoid loose-fill insulation materials in living spaces (minimizes indoor air quality problems).
G. Select cellulose insulation containing borates rather than ammonium sulfate.

1.2 SUBMITTALS

A. Product Data: Manufacturer's specifications for each type of insulation required, including binders additives, and expanding agents.

1.03 QUALITY ASSURANCE

A. Use aged and settled values for thermal resistance factors (R-values), tested in accordance with ASTM C518 at 75° F and 50% relative humidity for at least 6 months.

1.4 TESTING AND INSPECTIONS

A. Inspect insulation for proper installation. Correct defects, such as voids, gaps before accepting work.
B. Conduct blower door test to verify that air tightness of building envelope is better than 0.2 air changes per hour at 50 pascals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Structural insulated panels with EPS expanded polystyrene core: Use densities above 3 lb/sq. ft. , and as high a recycled content as possible (15% recycled content is common, up to 60% recycled content is available).
B. High strength XPS extruded polystyrene boardstock: 100 psi capacity - use only for maintaining a continuous thermal barrier around conditioned modules by separating them from foundations or ground they rest upon.
C. Foamed-in-Place Insulation: Closed-cell high-density polyurethane (Uses HFC-134a or hydrocarbons as blowing agent).
D. Radiant Barriers: Polyethylene film with aluminized layer
E. BioBased 2000 NB 2.0 lb/ft3 spray foam polyurethane closed cell insulation formulated with HFC-245fa as the blowing agent.
    1. BioBased 2000 NB spray foam insulation is a two-part product installed by Certified Dealers using custom designed application equipment. When installed, BioBased 2000 NB expands to completely fill all voids to effectively seal against air infiltration—often the major source of heat/cooling loss. BioBased 2000 NB also provides superior thermal and structural performance when compared to other insulation products. BioBased 2000 NB provides superior thermal and structural performance in conventional construction when compared to other insulation

products, but is especially effective in steel framed structures, metal buildings, and older homes.

2. BioBased 2000 NB is applied by spraying liquid chemical components onto open wall, ceiling, and floor surfaces; or into wall and other cavities. When applied, the components quickly expand to make a foam layer of millions of air pockets—covering surfaces and filling cracks and voids. The foam adheres to almost all surfaces, and when cured can be trimmed off to provide a surface that is ready for drywall or other finishing.

F. BioBased 501 (0.5 lb/ft3 spray foam polyurethane semi-open celled insulation) manufactured by BioBased Systems, LLC

1. Product Description: BioBased 501 spray foam insulation is a two-part, soy-based product installed by Certified Dealers using custom designed application equipment. When installed, BioBased 501 expands to completely fill all voids to effectively seal against air infiltration—often the major source of heat/cooling loss. BioBased 501 also provides superior acoustical and thermal performance when compared to other insulation products. While offering superior performance in conventional construction, it is especially effective in steel-framed structures, older homes and metal buildings.
2. BioBased 501 is applied by spraying liquid chemical components onto open wall, ceiling, and floor surfaces; or into wall and other cavities. When applied, the components quickly expand to make a foam layer of millions of air pockets—covering surfaces and filling cracks and voids. The foam adheres to almost all surfaces, and when cured can be trimmed off to provide a surface that is ready for drywall or other finishing.

2.2 ACCESSORY MATERIALS

A. Acoustical Caulk: Low-VOC

PART 3 - EXECUTION

3.1 INSTALLATION

A. Spray-Applied and Foamed-in-Place Insulation: shall be installed by licensed installers.
B. Radiant Barriers: Maintain airspace facing radiant barrier.

3.2 WASTE MANAGEMENT

A. Plan and coordinate the insulation work to minimize the generation of offcuts and waste. Reuse insulation scraps to the maximum extent feasible.
B. Separate and recycle waste materials in accordance with the Waste Management Plan and to the maximum extent economically feasible.

Material Safety Data Sheet

MSDS No. 1034
Revision: 02/10/2005

Section 1 - Chemical Product and Company Identification

Product/Chemical Name: Norseal V620, V710, V730, V740, V740FR, V760, V770, V780, V820, V830, V860, V980, V990 Foams
Chemical Family: Polyvinyl Chloride
Manufacturer: Saint-Gobain Performance Plastics, 1 Sealants Park, Granville, NY 12832
Phone (518) 642-2200, Fax (518) 642-1792
Emergency Telephone Number: ChemTel (800) 255-3924

☆☆☆☆☆ **Emergency Overview** ☆☆☆☆☆

Section 2 - Composition / Information on Ingredients

Exempt from regulation because foam is an "article" that does not release or otherwise result in exposure to a hazardous chemical under normal use.

Section 3 - Physical and Chemical Properties

Physical State:
Appearance and Odor: ....Soft Solid Foam
Water Solubility: .....Insoluble
% Volatile: .....N/A
Evaporation Rate: .....N/A

Density:		
	V730, V770, V780, V830	6 lb/ft^3
	V740	9 lb/ft^3
	V620	11 lb/ft^3
	V710, V780	12 lb/ft^3
	.....V760, V860, V980, V990	15 lb/ft^3

Section 4 - Fire-Fighting Measures

Extinguishing Media: Water, CO_2, or dry chemicals
Unusual Fire or Explosion Hazards: Generation of HCl fumes
Hazardous Combustion Products: CO and HCl
Fire-Fighting Equipment: Self-contained breathing apparatus (SCBA).

Section 5 - Stability and Reactivity

Stability: Stable
Hazardous Decomposition Products: CO and HCl

Section 6 - Health Hazard Information

Potential Health Effects

Carcinogenicity: IARC, NTP, and OSHA do not list as a carcinogen.
First Aid: N/A

Section 7 - Spill, Leak, and Disposal Procedures

Spill /Leak Procedures: N/A
Small Spills: N/A
Large Spills: N/A
Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Follow applicable Federal, State, and local regulations.

Section 8 - Exposure Controls / Personal Protection

Respiratory Protection: N/A. **Protective Clothing/Equipment:** None
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9 - Special Precautions and Comments

Handling Precautions: None. **Storage Requirements:** Store under 110°F for best performance

Disclaimer: The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereof; however, Saint-Gobain Performance Plastics Corporation makes no warranty with respect to the accuracy of the information or suitability of the recommendations, and assumes no liability to any use thereof.

END OF SECTION 07 20 00

PART 1 – GENERAL

1.1 SUMMARY

A. The work of this section includes, but is not limited to, the following:
   a. Materials and installation methods for fluid applied air and vapor barrier membrane system located in the non-accessible part of the wall.
   b. Materials and installation methods to bridge and seal air leakage pathways in roof and foundation junctions, window and door openings, control and expansion joints, masonry ties, piping and other penetrations through the wall assembly.

B. Related Sections: Other specification sections that directly relate to the works of this section include, but are not limited to, the following:
   a. Section 03300 – Cast-In-Place Concrete
   b. Section 04200 – Unit Masonry
   c. Section 07140 – Below Grade Waterproofing
   d. Section 07110 – Below Grade Dampproofing
   e. Section 07200 – Roof Membrane [and Vapor Retarder]
   f. Section 07600 – Flashing and Sheet Metal
   g. Section 07900 – Joint Sealers

1.2 PERFORMANCE REQUIREMENTS

A. Provide an air and vapor barrier system to perform as a continuous barrier to air infiltration/exfiltration and water vapor transmission and to act as a liquid water drainage plane flashed to discharge any incidental condensation or water penetration.
   1. Air Barriers: The building envelope shall be designed and constructed with a continuous air barrier to control air leakage into, or out of the conditioned space. An air barrier shall also be provided for interior partitions between conditioned space and space designed to maintain temperature or humidity levels which differ from those in the conditioned space by more than 50% of the difference between the conditioned space and design ambient conditions. The air barrier shall have the following characteristics:
      a. It must be continuous, with all joints made airtight.
      b. It shall have an air permeability not to exceed 0.004 cfm/ft2 under a pressure differential of 0.3 in. water. (1.57 psf.) (equal to 0.02L/s/m2 @ 75 Pa.).
      c. It shall be capable of withstanding positive and negative combined design wind, fan and stack pressures on the envelope without damage or displacement, and shall transfer the load to the structure. It shall not displace adjacent materials under full load.
      d. It shall be durable or maintainable.
      e. The air barrier shall be joined in an airtight and flexible manner to the air barrier material of adjacent systems, allowing for the relative movement of systems due to thermal and moisture variations and creep. Connection shall be made between:
         i. Foundation and walls.
         ii. Walls and windows or doors.
         iii. Different wall systems.
         iv. Wall and roof.
         v. Wall and roof over unconditioned space.
         vi. Walls, floor and roof across construction, control and expansion joints.
         vii. Walls, floors and roof to utility, pipe and duct penetrations.
   2. Air barrier penetrations: All penetrations of the air barrier and paths of air infiltration/exfiltration shall be made airtight

1.3 REFERENCES

The following standards and publications are applicable to the extent referenced in the text. The most recent version of these standards is implied unless otherwise stated.

A. E96 Test Methods for Water Vapor Transmission of Materials

B. D570 Test Method for Water Absorption of Plastics
C. E154 Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover
D. D1004 Test Method for Initial Tear Resistance of Plastic Film and Sheeting
E. D1938 Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method
F. D1876 Test Method for Peel Resistance of Adhesives
G. D1970 Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
H. D412 Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
I. E2178 Standard Test Method for Air Permeance of Building Materials
J. E2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product data, installation instructionsm use limitations and substrate preparation recommendations. Shop drawings showing locations and extent of air and vapor barrier system including details for terminations flashings, penetrations, window and door openings and treatment of substrate joints and cracks. Written documentation demonstrating installers qualifications under the "Quality Assurance" article including reference projects of a similar scope.
B. Samples: Submit representative samples of the following for approval:
    a. Self-Adhered Air Barrier Membrane
    b. Self-Adhered Transition Membrane
    c. Self-Adhered Through Wall Flashing

1.5 QUALITY ASSURANCE

A. Manufacturer: Air and vapor barrier systems shall be manufactured and marketed by a firm with a minimum of 20 years experience in the production and sales of waterproofing and air barrier products. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past five years.
B. Installer: The installer shall demonstrate qualifications to perform the work of this Section by submitting the following:
    a. List of at least three (3) projects contracted within the past five (5) years of similar scope and complexity to this project carried out by the firm and site supervisor.
    b. Installer must show evidence of adequate equipment and trained field personnel to successfully complete the project in a timely manner.
C. Materials: Self-adhered air and vapor barrier material shall be 40 mil (.004 in) comprising 36 mil (.0036 in.) rubberized asphalt integrally bonded to 4 mil (.0004 in.) cross-laminated polyethylene film. For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.
D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include but not be limited to the following:
    a. Review of submittals.
    b. Review of surface preparation, minimum curing period and installation procedures.
    c. Review of special details and flashings.
    d. Sequence of construction, responsibilities and schedule for subsequent operations.
    e. Review of mock-up requirements.
    f. Review of inspection, testing, protection and repair procedures.
E. Mock-up:
    a. Prior to installation of the air and vapor barrier system a field-constructed mock-up shall be

provided under the provisions of Section [01340 – Shop Drawings, Product Data, Samples and Mock-ups] to verify details and tie-ins and to demonstrate the required quality of materials and installation.

b. Construct a typical exterior wall section, 8 feet long and 8 feet wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing and any other critical junction (roof, foundation, etc).
c. Allow 24 hours for inspection and testing of mock-up before proceeding with air and vapor barrier work.
d. Mock-up may remain as part of the work.

F. Inspection and Testing: Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane until it has been inspected, tested and approved.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in labeled packages. Store and handle in strict compliance with manufacturer's instructions, recommendations and material safety data sheets. Protect from damage from sunlight, weather, excessive temperatures and construction operations. Remove damaged material from the site and dispose of in accordance with applicable regulations.
B. Do not double-stack pallets of fluid applied membrane components on the job site. Provide cover on top and all sides, allowing for adequate ventilation.
C. Protect fluid-applied membrane components from freezing and extreme heat.
D. Sequence deliveries to avoid delays, but minimize on-site storage.

PART 2 – PRODUCTS

2.1 GENERAL

A. For each type of material required for the work of this section, provide primary materials that are the products of one manufacturer.

2.2 SELF-ADHERED AIR BARRIER MEMBRANE

A. Perm-A-Barrier Wall Membrane: Self-Adhered Sheet Membrane Air Barrier, Vapor Impermeable.
B. Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.
C. Performance Requirements: Thickness: 1.0 mm (0.040 in.) nominal, Water Absorption: Max. 0.1% by weight, Tensile Strength: Min. 2.7 MPa (400 psi), Water Vapor Permeance: Less than 2.9 ng/Pa.s.m^2 (0.05 Perms), Air Permeance at 75Pa (0.3 in. water) Differential Pressure: <0.001 L/(s.m^2) (<0.0002 cfm/ft^2).

2.3 TRANSITION MEMBRANE

Description: Min. 1 mm (.040 in) thick membrane comprised of 0.9 mm (0.036 in) of self-adhesive rubberized asphalt integrally bonded to 0.1 mm (.004 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

Performance Requirements:

Water Vapor Transmission: ASTM E 96, Method B:	2.9 ng/m2sPa (0.05 perms) max.
Air Permeance at 75Pa (0.3 in. water) pressure difference:	0.0006 L/(s.m^2) (0.00012 cfm/ft^2) max.
Puncture Resistance:	ASTM E 154: 178 N (40 lbs.) min.
Lap Adhesion at –4°C (25°F), ASTM D 1876:	880 N/m (5.0 lbs./in.) of width min.
Low Temperature Flexibility, ASTM D 1970:	Unaffected to –43°C (-45°F).
Tensile Strength, ASTM D 412, Die C Modified:	min. 2.7 MPa (400 psi)
Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D 412 Die C:	min. 200%

Materials:

Perm-A-Barrier Detail Membrane manufactured by Grace Construction Products.

2.4 FLEXIBLE MEMBRANE WALL FLASHING

Description: Min. 1 mm (.040 in) thick membrane comprised of 0.8 mm (0.032 in) of self-adhesive rubberized asphalt integrally bonded to 0.2 mm (.008 in) of cross-laminated, high-density polyethylene film. Membrane shall be interleaved with disposable silicone-coated release paper until installed.

Performance Requirements:

Water Vapor Transmission, ASTM E 96, Method B:	2.9 ng/m2sPa (0.05 perms) max.
Water Absorption, ASTM D 570:	max. 0.1% by weight
Puncture Resistance, ASTM E 154:	356 N (80 lbs.) min.
Tear Resistance	
a. Initiation ASTM D 1004:	min. 58 N (13.0 lbs.) M.D.
b. Propagation ASTM D 1938:	min. 40 N (9.0 lbs.) M.D.
Lap Adhesion at -4ºC (25ºF), ASTM D 1876:	880 N/m (5.0 lbs./in.) of width
Low Temperature Flexibility, ASTM D 1970:	Unaffected to -43ºC (-45ºF)
Tensile Strength, ASTM D 412, Die C Modified:	min. 5.5 MPa (800 psi)
Elongation, Ultimate Failure of Rubberized Asphalt, ASTM D412, Die C:	min. 200%

Materials:

Perm-A-Barrier Wall Flashing manufactured by Grace Construction Products.

2.5 AIR AND VAPOR BARRIER ACCESSORIES

A. Primer: Water-based primer which imparts an aggressive, high tack finish on the treated substrate
   1. Flash Point: No flash to boiling point
   2. Solvent Type: Water
   3. VOC Content: Not to exceed 10 g/l
   4. Application Temperature: -4°C (25°F) and above
   5. Freezing point (as packaged): -7°C (21°F)
   6. Product: Perm-A-Barrier WB Primer manufactured by Grace Construction Products.
B. Sealant: Two-part, elastomeric, trowel grade material designed for use with self-adhered membranes and tapes. 10 g/l max. VOC Content.
   1. Product: Bituthene® Liquid Membrane manufactured by Grace Construction Products.
C. Optional Primers:
   1. Description: High tack water based primer. 10 g/l max. VOC content.
      a. Product: Perm-A-Barrier Liquid Part B manufactured by Grace Construction Products.
   2. Description: High tack low VOC solvent based primer. <200 g/l max. VOC content.
      a. Product: Bituthene Primer B2 LVC manufactured by Grace Construction Products.
   3. Description: High tack solvent based primer. 440 g/l max. VOC content.
      a. Product: Bituthene Primer B2 manufactured by Grace Construction Products.

PART 3 – EXECUTION

Perform work only when existing and forecasted weather conditions are within the limits established by the manufacturer of the materials used. Proceed with installation only when the substrate construction and preparation work is complete and in condition to receive the air and vapor barrier membrane.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85757 MSDS Date: 02/07/2006

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Waterproofing Membrane
MSDS Number: M-85757
Cancelled MSDS Number: M-85748
MSDS Date: 02/07/2006
Chemical Family Name: Rubberized Asphalt Adhesive Sheet with Film and/or Mesh Comprising Various Components.
Product Use: Waterproofing Membrane.
Chemical Formula: Mixture-NA
CAS # (Chemical Abstracts Service Number): Mixture-NA

Manufactured by:

W.R.Grace & Co.-Conn.	Grace Canada, Inc.
62 Whittemore Avenue	294 Clements Road West
Cambridge, MA 02140	Ajax, Ontario L1S 3C6

In Case of Emergency Call:
In USA: (617) 876-1400 In Canada: (905) 683-8561

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS#	Percent (max)
Heavy Paraffinic Distillate Solvent Extract	064742-04-7	10-25
Petroleum Asphalt	008052-42-4	50-100
Styrene-Butadiene block copolymer	009003-55-8	10-25

SECTION 3 - HAZARDS IDENTIFICATION

Emergency Overview:

Warning!

Eye contact with rubberized asphalt residue on hands can cause irritation.
Skin contact with rubberized asphalt can cause irritation.
May be harmful if ingested.
May be harmful if absorbed through skin.
May cause teratogenic effects.
May produce local skin tumors.
Removal of release liner may generate a static electrical discharge (spark).
Release liners are slippery. Remove from work area immediately.

HMIS Rating:

Health:	2*
Flammability:	1
Reactivity:	0
Personal Protective Equipment:	B (See Section 8)

Potential Health Effects:

Inhalation: Due to the physical nature of this product, inhalation is unlikely.
If heated, inhalation of vapor causes irritation, sore throat, coughing and breathing difficulty.
Effects include: Nausea, headache, dizziness and irritation.
Eye Contact: Eye contact with rubberized asphalt residue on hands can cause irritation
Skin Contact: Skin contact causes irritation.
Prolonged skin contact can result in dermatitis.
Contact with petroleum oils in this product, may produce serious toxic effects including skin cancer, liver damage, blood effects and effects on the unborn based on tests with laboratory animals. Animal tests indicate that prolonged and repeated skin contact to the oils in this product may produce local skin tumors.
Individuals with pre-existing skin disorders may be at increased risk for worsening their condition from exposure to this product.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85757 MSDS Date: 02/07/2006

Skin Absorption: Product can be absorbed through the skin upon prolonged contact resulting in systemic effects such as nausea, headache, and general discomfort.
Ingestion: Due to the physical nature of this product, ingestion is unlikely.
If ingested, causes burns to the linings of the mouth, esophagus and stomach.
Effects include: Nausea, vomiting and diarrhea.
Wash hands before eating.

SECTION 4 - FIRST AID MEASURES:

Skin Contact: In case of skin contact, clean fingernails and wash skin with soap and water. If residue remains, clean with waterless hand-cream or abrasive soap. Never use solvents.
If discomfort or irritation persists, consult a physician.
Remove contaminated clothing and wash before reuse.
Eye Contact: Flush eyes with water for at least 15 minutes while holding eyelids open.
Get immediate medical attention.
Ingestion: If swallowed, contact a physician immediately.
Never give anything by mouth to an unconscious person.
The decision to induce vomiting should only be made by a physician.
Inhalation: If symptoms develop, get fresh air. If symptoms persist, consult a physician.
If breathing has stopped, give artificial respiration then oxygen if needed.
Get immediate medical attention.

SECTION 5 - FIRE AND EXPLOSION HAZARD DATA

Flash Point:	>210C (>410F)
Flash Point Method:	Open Cup
Lower Explosion Limit:	Not Available
Upper Explosion Limit:	Not Available
Auto-Ignition Temperature:	Not Available

NFPA Rating:

Health:	1
Flammability:	1
Reactivity:	0

Extinguishing Media: In case of fire, use water spray, dry chemical, Carbon dioxide or foam.
Special Fire Fighting Procedures:
Wear self-contained breathing apparatus and complete personal protective equipment when potential for exposure to vapors or products of combustion exist. Avoid breathing hazardous vapors or products of combustion, keep upwind. Isolate area and keep unnecessary people away. Prevent run-off from fire control or dilution from entering streams or drinking water supplies.
Unusual Fire and Explosion Hazards: None unless noted below.
Removal of release paper may create a static electric discharge (sparks). Do not remove where sparks may ignite flammable vapors.

SECTION 6 - ACCIDENTAL RELEASE MEASURES:

Spills/Leaks: Due to the physical nature of this product, spills are not possible.

SECTION 7 - HANDLING AND STORAGE

Precautionary Measures: Avoid contact with eyes, skin and clothing.
Practice good personal hygiene to avoid ingestion.
Use only with adequate ventilation.
Wash clothing before reuse.
Slippery when wet or covered with frost.
Do not apply where membrane odors may penetrate living areas.
To avoid skin contact, use gloves or barrier creams. Promptly cleanse hands with waterless hand cleaner, clean fingernails and wash with soap and water after handling.
Release liners are slippery. Remove from work area immediately after membrane application.
Consistent with good roofing practice, always wear fall protection when working on roof decks.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85757 MSDS Date: 02/07/2006

FOR PROFESSIONAL USE ONLY. KEEP OUT OF CHILDREN'S REACH.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

EXPOSURE GUIDELINES (US)

Ingredient	ACGIH TLV			OSHA PEL			Other
	TWA	STEL	Ceiling	TWA	STEL	Ceiling	
Heavy Paraffinic Distillate Solvent Extract	-	-	-	-	-	-	-
Petroleum Asphalt	0.5 mg/m3 TWA (inhalable fraction); (as benzene-soluble aerosol)	-	-	-	-	-	-
Styrene-Butadiene block copolymer	-	-	-	-	-	-	-

EXPOSURE GUIDELINES (CANADA)

Employers should consult local Provincial regulatory limits for exposure guidelines, which may vary locally.

Engineering Controls: Not generally required.

Personal Protective Equipment:

Respiratory Protection: Respiratory protection is not generally required. If exposure limits are exceeded, wear approved respiratory protection.
Skin Protection: Use oil impervious gloves to avoid prolonged or repeated contact with rubberized asphalt residue.
Eye Protection: Not required for normal use.
Work/Hygienic Practices: Use good personal hygiene practices.
Avoid rubbing eyes while handling. Due to the physical nature of this product, ingestion is unlikely. Incidental ingestion of residue on hands can be avoided by using good personal hygiene practices. This product contains compounds subject to exposure guidelines and/or identified as carcinogens. (See Sections 8 and 11). However, due to the physical nature of this product, these compounds are unlikely to reach exposure limits unless airborne dust or spray mist is created. To avoid skin contact, wear recommended gloves (see skin protection recommendation) and wash with soap and water after handling. Intermittent or occasional skin contact with petroleum asphalt is not expected to have serious health effects as long as good personal hygiene measures are taken. Promptly cleanse with waterless hand cleaner, clean fingernails and wash with soap and water after handling. All employees working with this product must exercise good and prudent personal hygiene practices.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Solid sheet
Appearance/Odor: A black, rubberized asphalt adhesive layer on a grey/black plastic sheet with a paper or plastic release sheet. Petroleum odor.
Odor Threshold: (ppm) Unknown
pH: Not Applicable
Vapor Pressure: (Mm Hg) Not Applicable
Vapor Density: (Air = 1) Not Applicable
Solubility In Water: Negligible
Specific Gravity: (Water = 1) 1.0 - 1.1
Evaporation Rate: (Butyl Acetate = 1) Not Applicable
Boiling Point: Not Applicable
Viscosity: Not Available
Bulk Density: (Pounds/Cubic Foot)(Pcf): ~70
% Volatiles (gr/L): (70°F) (21°C) Negligible

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable
Conditions To Avoid: Heat, Oxidizing materials, Strong oxidizers and Water.
Hazardous Polymerization: Will not polymerize.

Hazardous Decomposition: Carbon dioxide, Carbon monoxide, Sulfur oxides and Low
Products: Molecular weight hydrocarbons

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85757 MSDS Date: 02/07/2006

SECTION 11 - TOXICOLOGICAL INFORMATION
Ingredient(No data unless listed.) CAS Number LD50 and LC50
Carcinogenicity:

Ingredient	IARC Group 1	IARC Group 2A	IARC Group 2B	NTP Known	NTP Suspect	OSHA
Heavy Paraffinic Distillate Solvent Extract	Yes	No	No	No	No	Yes
Petroleum Asphalt	No	No	Yes	No	No	No
Styrene-Butadiene block copolymer	No	No	No	No	No	No

Animal tests indicate that prolonged and repeated skin contact with the asphalt in this product may produce local skin tumors.

Mutagenicity: Not applicable.

Teratogenicity: Petroleum oils in this product have caused effects on the unborn based on tests with laboratory animals.

Reproductive Toxicity: Not applicable.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Fate: No data available for product.

Ecotoxicity: No data available for product.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Procedures: Consult all regulations (federal, state, provincial, local) or a qualified waste disposal firm when characterizing waste for disposal. According to EPA (40 CFR § 261), waste of this product is not defined as hazardous. Dispose of waste in accordance with all applicable regulations.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Not Applicable
UN/NA Number: Not Applicable
Domestic Hazard Class: Nonhazardous
Surface Freight Classification: Asphalt Mixture, N.O.I.B.N.
Label/Placard Required: Not Applicable

SECTION 15 - REGULATORY INFORMATION
REGULATORY CHEMICAL LISTS:

CERCLA (Comprehensive Response Compensation and Liability Act): (None present unless listed below)

Chemical Name	CAS #	Wt %	CERCLA RQ

SARA Title III (Superfund Amendments and Reauthorization Act)

SARA Section 312/Tier I & II Hazard Categories:

Health Immediate (acute) Yes
Health Delayed (chronic) Yes
Flammable No
Reactive No
Pressure No

302 Reportable Ingredients (Identification Threshold 1%.):

Chemical Name	CAS #	Wt %	SARA 302 TPQ

313 Reportable Ingredients (Chemicals present below reporting threshold are exempt):

Chemical Name	CAS #	Wt %

National Volatile Organic Compound Emission Standards For Architectural Coatings:

Volatile Organic Content: (gr/L) Not Applicable

WHMIS Classification(s): D2 B

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85757 MSDS Date: 02/07/2006

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR). This MSDS contains all the information required by the CPR.

State Regulatory Information:

California Proposition 65: This product contains substances known to the state of California to cause cancer, birth defects or other reproductive harm.

Massachusetts Hazardous Substance List(Identification threshold 0.001%(1ppm)):

Chemical Name	CAS #	Wt %
Heavy Paraffinic Distillate Solvent Extract	064742-04-7	21

New Jersey Hazardous Substance List(Identification threshold (0.1%)):

Chemical Name	CAS #	Wt %

Pennsylvania Hazardous Substance List(Identification threshold 0.01%):

Chemical Name	CAS #	Wt %

CHEMICAL INVENTORY STATUS:

All chemicals in this product are listed or exempt from listing in the following countries:

US	CANADA		EUROPE	AUSTRALIA	JAPAN	KOREA	PHILIPPINES
TSCA	DSL	NDSL	EINECS/ELINCS	AICS	ENCS	ECL	PICCS
Yes	Yes	No	Yes	Yes	Not Determined	Yes	Yes

SECTION 16 - OTHER INFORMATION

BITUTHENE® WATERPROOFING MEMBRANE 3000, 5000, 9004, 9016, 5004, 4008, 2000, 6000
BITUTHENE® WATERPROOFING MEMBRANE 374, CP
BITUTHENE® WATERPROOFING MEMBRANE STRIPS 3000, 5000, 3000-90
BITUTHENE® LOW TEMPERATURE WATERPROOFING MEMBRANE, MEMBRANE STRIPS
BITUTHENE® SYSTEM 4000 WATERPROOFING MEMBRANE, MEMBRANE STRIPS
PERM-A-BARRIER® WALL FLASHING, PERM-A-BARRIER® WALL MEMBRANE,
PERM-A-BARRIER® LOW TEMPERATURE MEMBRANE, PAB SYSTEM 4000
GRACE ICE & WATER SHIELD®, PRMA MEMBRANE
GRACE ROOF DETAIL MEMBRANE, INSULWRAP P-300, P-400, P-460 AND P-500, PITTWRAP CW
GRACE® SELECT, VYCOR® V40 WEATHER BARRIER STRIPS, GRACE VYCOR® PLUS TAPES
GRACE® BASIKTM
BITUSTIK™, HATCH TAPE, GRACE VYCOR DECK PROTECTOR, GRACE VYCOR ALL PURPOSE FLASHING
Non-Hazardous Ingredient Disclosure:

Chemical Name	CAS Number

Prepared by: EH&S Department
Approved by: EH&S Department
Approved Date: 02/07/2006

Disclaimer:
"The data included herein are presented in accordance with various environment, health and safety regulations. It is the responsibility of a recipient of the data to remain currently informed on chemical hazard information, to design and update its own program and to comply with all national, federal, state and local laws and regulations applicable to safety, occupational health, right-to-know and environmental protection."

END OF SECTION 07 27 13

PART 1 – GENERAL

1.1 SUMMARY

A. All roof cladding design drawings as well as zinc layout and joint detail drawings should be reviewed by zinc manufacturer prior to start of installation.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Rheinzink Titanium Zinc pre weathered Pro type (pickling process). Alloy is electrolytic high-grade zinc (DIN 1706) with a 99.995% Zn degree of purity and alloying additives of 1% Copper and 1% Titanium. Phosphate coatings are not acceptable.
   a. Minimum thickness roof cladding 0.70 mm
   b. Minimum thickness wall cladding 0.80 mm

2.2 FINISH

A. Zinc finish shall be Rheinzink pre weathered Plus for all visible areas.

2.3 ACCESSORIES

A. Solder Lead / tin soft solder containing 40% tin and 60% lead.
   a. Flux: Z-04-S flux is recommended.
   b. Sealant: 100% pure silicone rubber with neutral cure, non-acid based. Colour: dark grey or translucent.

2.4 MEMBRANE

A. Grace underlay Bituthene 3000

2.5 UNDERLAY

A. Enkamat 7210 spacermat (polyamide separation layer).

2.6 FIXINGS

A. Nails: Hot dipped galvanised steel self-tapping screws with large flat head 2.5x19mm to install underflashings & starter strips.
B. Screws: SS counter sunk, undercut screws. A gauge, 20 mm to install fixing clips.
C. Fixing clips: SS-fixed type and sliding type fixing clips.

2.7 SUBSTRUCTURE-PLYWOOD

A. Substructure: Roof: Structural plywood D/D grade min. 19mm, A bond.
B. Purlin spacing: 600 or 800 mm. Wall: Structural plywood D/D grade min. 17 mm, A bond.
C. Substructure-Secondary Steel (to fix plywood sheets). Wall: Square Hollow Section (mild steel) to curved areas, 35mm spaced at 600mm. Wall: Top Hat Section galvanised to straight areas, 35mm spaced at 600mm
D. Safety Mesh: To comply with Australian safety requirements.

2.8 INSULATION

A. With vapour barrier, the vapour barrier has to be installed to warm side of application, check with Engineer on climate zone requirements.

2.9 FABRICATION

A. A minimum temperature of 10° Celsius has to be maintained while forming the zinc alloy.
B. The trays should be manufactured from pre levelled blanks with a roll forming machine. Additional formwork, like rounding, bending and folding can easily be carried out with conventional tools and equipment. The minimum bending radius is 1.75 mm. Sharp instruments for marking and bending should be avoided.

PART 3 – EXECUTION

3.1 STORAGE AND HANDLING

A. Zinc coils and sheets should only be delivered to site when work is ready to start.
B. Ensure that no water penetrates the coils or stacked sheets during transport and storage.
C. Store material in a dry, ventilated room on dry pallets on a dry floor.
D. Should white dust appear on the surface of the material remove it immediately with a brush and water and let dry.
E. Transport and store under dry, ventilated conditions. While in storage at the shop or on site, contact between moisture, such as with wet sheeting or tarps, and the surface of the metal must be avoided.
F. Provide ventilation to covered Rheinzink materials
G. Transport covered on dry pallets
H. Avoid tight stacking
I. Provide abrasion protection when transporting
J. Allow material to sit unopened for several days upon receipt to allow for acclimation to the storage area's temperature and humidity

3.1 INSTALLATION

A. The installer must be approved by supplier of the materials before any work is commenced and must be specifically trained and experienced in the application of zinc to have a material warranty issued.
B. The Subcontractor should provide documented proof of successfully installed non-ferrous metal installations of similar project size.
C. Please contact Craft Metals for approved installers. Phone 02 94824166, 03 9850 8029
D. The sequence of installation is from the bottom to the top.
E. Dimensions of roof trays: Max. length: 17,000mm. Rec. width: 670 mm girth (600 mm between seams)
F. Parapet: Max. length: 4000mm
G. Wall: Max. length: 6000mm. Max. width: 570mm girth (500mm between seams)
H. Panels, trays, copings and flashings shall be fixed in a manner to allow for thermal expansion and contraction of the metal.
I. Ventilation gap min. 35 mm, with adequate bottom air inlet and ridge air outlet slots with flashings to avoid water intake.

3.2 JOINTS

A. Use double standing seam technique for roof claddings and angle seam-, or a roll cap technique for wall claddings.
B. All joints - including expansion joints - within the zinc roof system and with materials adjacent to the zinc shall be rain proof.
C. Joints at penetrations and flashings should be made water tight by means of soldering, welting or double welting.
D. The minimum required overlap depends on the wall pitch: refer to zinc manufacturers recommendations.
E. Fasten every fixing clip with tow SS screws. Use sliding clips if the trays are longer than 2000 mm. The distance between fixing clips should not exceed 330 mm. Refer to zinc manufacturers recommendations regarding the position of sliding/fixed clips and amount of clips required.

END OF SECTION 07 41 00

PART 1 - GENERAL

1.1 WARRANTIES

A. Minimum 20-year manufacturer warranty

1.2 ENVIRONMENTAL CONSIDERATIONS

A. Select most durable products (conserves resources).
B. Select products with recycled content (conserves resources).
C. Select products with lower environmental impacts.
D. Select resource-efficient products.
E. Use protected-membrane roof system to facilitate reuse of insulation (conserves resources).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Single-Ply Membranes: without chlorine or halogenated fire retardants. Thermoplastic membrane:
   1. Thermoplastic olefin (TPO)
   2. Ethylene propylene diene monomer (EPDM)
B. Fluid-Applied Roofing: Reflective elastomeric coating that complies with Energy Star® Roof Program
   1. Low-VOC (less than 10 grams/liter)
   2. 20-25% recycled content
   3. Reflective acrylic latex coating that complies with Energy Star Roof Program
C. Green Roofs [Protects membrane and permits rooftop planting; reduces roof runoff by 50% for a typical storm; reduces heat gain through roof]
   1. Felt Underlayment: 30% recycled fiber content
   2. Roofing membrane: Single-ply membrane
   3. Root barrier Geotextile
   4. Drainage layer
   5. Soil and vegetation layer

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

3.2 WASTE MANAGEMENT

A. Separate and recyclable materials in accordance with Waste Management Plan.
B. Separate metal banding for recycling.

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 1

SECTION 1: PRODUCT IDENTIFICATION

Product Name:	Firestone Ultraply TPO Membrane
Chemical Name / Synonym:	Ultraply TPO (White, Tan, Gray), UltraPly TPO 96 (White, Tan, Gray), UltraPly TPO 120 (White, Tan, Gray), UltraPly TPO XR, TPO 18" Curb Flashing
Chemical Family:	Thermoplastic Polyolefin
24-Hour Emergency Phone:	(800) 424-9300 CHEMTREC
Manufacturer's Name:	Firestone Building Products Company
Manufacturer's Address:	310 East 96th Street, Indianapolis, IN 46240
NFPA Hazard Rating:	Health 1, Flammability 1, Reactivity 0
HMIS Hazard Rating:	Health 0, Flammability 1, Reactivity 0

SECTION 2: CHEMICAL COMPOSITION

Chemical Name:	Common Name:	CAS #:	% (by wt)	Exposure Limits:
Nonhazardous as per 29 CFR 1910.1200.	None	None	100	None Established

SECTION 3: HAZARD IDENTIFICATION

Primary Route of Exposure:	None
Signs and Symptoms of Exposure:	No known adverse effects
Medical Conditions Aggravated by Exposure:	None known
Chronic Effects:	No known adverse effects
Carcinogenicity:	None

SECTION 4: FIRST AID MEASURES

First Aid Procedures:	No special action necessary.

SECTION 5: FIRE FIGHTING PROCEDURES

Suitable Extinguishing Media:	Carbon dioxide, foam, sand/earth, or dry chemicals.
Hazardous Combustion Products:	Carbon dioxide and carbon monoxide, oxides of nitrogen, sulfur dioxide, partially burned carbon.
Recommended Fire Fighting Procedures:	Wear impermeable protective clothing and self-contained breathing apparatus. Toxic fumes and vapors may be evolved.
Unusual Fire and Explosion Hazards:	None known

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 2

SECTION 6: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled:	Not Applicable
Precautions to Be Taken in Handling and Storing:	No special handling precautions. Store where materials are not exposed to excessive heat, cold or moisture.

SECTION 7: EXPOSURE CONTROLS / PERSONAL PROTECTION

Ventilation:	Store and use in well ventilated areas.
Respiratory Protection:	None required
Eye Protection:	None required
Skin Protection:	None required
Other:	None
Work / Hygienic Practices:	Wash exposed skin prior to eating, drinking or smoking and at the end of each shift. Wash contaminated clothing prior to reuse.

SECTION 8: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor:	Black and white sheet, white and gray sheet, tan and gray sheet, gray and gray sheet or white sheet with fleece back membrane. Essentially no odor.		
Flash Point:	Not Applicable	Lower Explosive Limit:	None
Method Used:	Not Applicable	Upper Explosive Limit:	None
Evaporation Rate:	Not Applicable	Boiling Point:	None
pH (undiluted product):	Not Applicable	Melting Point:	Unknown
Solubility in Water:	Insoluble	Specific Gravity:	0.94
Vapor Density:	Not Applicable	Percent Volatile:	Unknown
Vapor Pressure:	Not Applicable		

SECTION 9: STABILITY AND REACTIVITY

Thermal Stability:	Stable
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	None known

SECTION 10: TRANSPORTATION

Regulatory Agency:	Not Regulated
Proper Shipping Name:	Not Applicable
Hazard Classification:	Not Applicable
Identification Number:	Not Applicable
Labels Required:	Not Applicable
Other Requirements:	Not Applicable

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 3

SECTION 11: MISCELLANEOUS INFORMATION

Additional Comments:	This product is considered an article as per 29 CFR 1910.1200 and is, therefore, exempt from the requirements of the Hazard Communication standard.
Date of Previous MSDS:	February 9, 2005
Changes Since Previous MSDS:	Address change in section 1
Telephone Number for Additional Information:	(317) 575-7137

DISCLAIMER

The information contained herein is based on data considered accurate which has been obtained from other companies and organizations. However, no warranty or representation is expressed or implied that the information, is accurate, complete or representative. Firestone Building Products Company, a subsidiary of Bridgestone Americas Holding, Inc. assumes no responsibility for injury to the buyer, the buyer's employees, or any third persons, if reasonable safety procedures are not followed. Additionally, Firestone Building Products Company assumes no responsibility for injury to buyer, the buyer's employees, or any third persons caused by abnormal use of this material, even if reasonable safety procedures are followed.

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 1

SECTION 1: PRODUCT IDENTIFICATION

Product Name:	RubberGard® EPDM Series
Chemical Name / Synonym:	LSFR, Rubbergard Max, Rubbergard Platinum
Chemical Family:	Mixture
24-Hour Emergency Phone:	(800) 424-9300 CHEMTREC
Manufacturer's Name:	Firestone Building Products Company
Manufacturer's Address:	310 East 96th Street, Indianapolis, IN 46240
NFPA Hazard Rating:	Health 1, Flammability 1, Reactivity 0
HMIS Hazard Rating:	Health 0, Flammability 1, Reactivity 0

SECTION 2: CHEMICAL COMPOSITION

Chemical Name:	Common Name:	CAS #:	% (by wt)	Exposure Limits:
Nonhazardous as per 29 CFR 1910.1200.	None	None	100	None Established

SECTION 3: HAZARD IDENTIFICATION

Primary Route of Exposure:	None
Signs and Symptoms of Exposure:	No known adverse effects.
Medical Conditions Aggravated by Exposure:	Sensitive individuals may exhibit eye, nose, throat or dermal irritation with prolonged exposure to processing fumes or vapors.
Chronic Effects:	No known adverse effects.
Carcinogenicity:	None

SECTION 4: FIRST AID MEASURES

First Aid Procedures:	No special action necessary.

SECTION 5: FIRE FIGHTING PROCEDURES

Suitable Extinguishing Media:	Carbon dioxide, foam, sand/earth, or dry chemicals.
Hazardous Combustion Products:	Carbon dioxide and carbon monoxide, oxides of nitrogen, sulfur dioxide, and partially burned carbon.
Recommended Fire Fighting Procedures:	Wear impermeable protective clothing and self-contained breathing apparatus. Toxic fumes and vapors may be evolved.
Unusual Fire and Explosion Hazards:	Oil 'bleeds' from material when burning.

SECTION 6: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled:	Not Applicable
Precautions to Be Taken in Handling and Storing:	Keep away from heat, sparks, and open flames. Store in a dry area. Storage area should be well ventilated.

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 2

SECTION 7: EXPOSURE CONTROLS / PERSONAL PROTECTION

Ventilation:	Store and use in well ventilated areas.
Respiratory Protection:	None recommended.
Eye Protection:	None recommended.
Skin Protection:	None recommended.
Other:	None.
Work / Hygienic Practices:	Wash exposed skin prior to eating, drinking or smoking and at the end of each shift. Wash contaminated clothing prior to reuse.

SECTION 8: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor:	Black solid with slight rubber odor.		
Flash Point:	Not Applicable	Lower Explosive Limit:	None
Method Used:	Not Applicable	Upper Explosive Limit:	None
Evaporation Rate:	Not Applicable	Boiling Point:	None
pH (undiluted product):	Not Applicable	Melting Point:	Unknown
Solubility in Water:	Insoluble	Specific Gravity:	Varies
Vapor Density:	Not Applicable	Percent Volatile:	Unknown
Vapor Pressure:	Not Applicable		

SECTION 9: STABILITY AND REACTIVITY

Thermal Stability:	Stable
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Heat, sparks, and open flames.

SECTION 10: TRANSPORTATION

Regulatory Agency:	Not Regulated
Proper Shipping Name:	Not Applicable
Hazard Classification:	Not Applicable
Identification Number:	Not Applicable
Labels Required:	Not Applicable
Other Requirements:	Not Applicable

SECTION 11: MISCELLANEOUS INFORMATION

Additional Comments:	This product is considered to be a finished article as per 29 CFR 1910.1200 (C) and is, therefore, exempt from the requirements of the Hazard Communication standard.
Date of Previous MSDS:	March 25, 2003
Changes Since Previous MSDS:	Address change in section 1; comment change in section 11.
Telephone Number for Additional Information:	(317) 575-7190

Firestone Building Products Company
Material Safety Data Sheet

December 9, 2005 Page: 3

DISCLAIMER

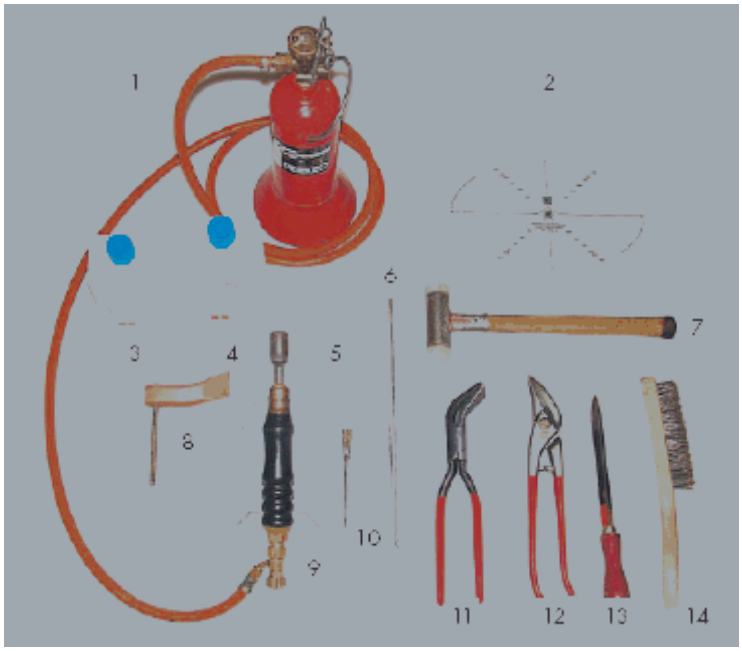
The information contained herein is based on data considered accurate which has been obtained from other companies and organizations. However, no warranty or representation is expressed or implied that the information, is accurate, complete or representative. Firestone Building Products Company, a subsidiary of Bridgestone Americas Holding, Inc. assumes no responsibility for injury to the buyer, the buyer's employees, or any third persons, if reasonable safety procedures are not followed. Additionally, Firestone Building Products Company assumes no responsibility for injury to buyer, the buyer's employees, or any third persons caused by abnormal use of this material, even if reasonable safety procedures are followed.

END OF SECTION 07 54 00

PART 1 - GENERAL
1.1 This section includes information on various Rheinzink products.

PART 2 – PRODUCTS
2.1 FLASHING, ROOFING, GUTTER AND DOWNSPOUTS
A. Rheinzink, zinc flashing, roofing, gutters, and downspouts

2.2 TOOLS AND MATERIALS
A. Equipment:
1. Small Gas Bottle and Hose
2. Gutter Outlet Template
3. Flux “ZD-pro” by Felder
4. Solvent-pro by Felder
5. Sal Ammoniac Block
6. Solder Bar
7. Plastic Faced Hammer
8. Hammer Shaped Soldering Bit
9. Soldering Iron on support
10. Brush for Flux
11. Seaming Plier, 45° angled
12. Combination Tin Snip
13. Deburring Tool
14. Wire Brush



PART 3 – EXECUTION
3.1 SODERING TECHNIQUES
A. The following must be taken into account when soldering RHEINZINK®:
1. The contact surfaces of the soldered joint must be free of dust, dirt and moisture.
2. Use a 3/4 lb (350 g) min. hammer shaped soldering bit; 1.1 lb (500 g) is ideal.
3. The temperature of the soldering iron should be ~ 480 °F (~ 250 °C). If the temperature is in the correct range, you should see light smoke formation when the soldering iron is in contact with the sal ammoniac block.
4. For optimum temperature regulation of the soldering iron, propane gas is recommended.
5. “ZD-pro” flux by Felder is recommended.*
6. 40/60 or 50/50 solder with an antimony content of < 0.5 % weight (L-Pb Sn 40 (Sb) or L-Pb Sn 50 (Sb)) as per ISO 9453 is recommended.
7. Adjacent gutters should be overlapped a distance of 3/8" to 5/8" (10-15 mm) to create a proper solder joint.
8. The gap between the overlapping parts must not exceed 0.020" (0.5 mm).
9. The gutter must be soldered the entire length of the gutter overlap.

3.1 GUTTER INSTALLATION
A. The installation height of the gutter should be such that the projected extension of the roof surface runs into the gutter. In heavy snowfall areas, it should be installed somewhat lower, so that the snow can slide over the gutter.
B. Locate the highest point of the gutter. The extension of the roof surfact should extend into the gutter.
C. Fasten the mounting rail with a slope of 1/8” – 3/8” per 10’-0”. Mount the rail with the longer leg at the bottom.
D. Mount adjacent rails with a gap of 1/8” to ¼” to accommodate linear thermal expansion.
E. Locate the gutter brackets at a maximum spacing of 3’.
F. Lock each bracket into place by twisting it 90 degrees clockwise.

3.2 MOUNTING THE HALF ROUND GUTTER

A. The upper gutter section should lap on top off the lower gutter section. For this reason, gutter installation should always begin at the gutter outlet (the lowest point of the gutter) and continue up stream from there.
B. Preparing the cutout for the gutter plug in outlet:
    1. Mark the exact location of the cutout using the gutter outlet template. Align the centerline of the template at the lowest point of the gutter.
    2. Cut out the opening for the gutter outlet. The outlet hole should be 3/16” inside the oval drawn with the template.
    3. Create a drip edge by bending the 3/16” edge towards the outside of the gutter.
    4. Insert gutter into snap lock brackets.
    5. Snap the gutter bead onto the nose of the snap lock bracket on the front.
C. Inserting the plug in the outlet:
    1. Hook the plug in outlet into the gutter bead.
    2. Bend the rear tabs around the water check at the back of the gutter.
D. Soldering spherical end caps:
    1. Mark the 3/8” wide soldering joint overlap
    2. Cut away the rear water check in the overlap area
    3. The notch should be 3/8” x 3/8”
    4. Apply flux to the contact surfaces of the soldering joint.
    5. Twist the end cap into place
    6. Apply flux to the overlap area
    7. Attach the end cap by tack soldering
    8. Solder the entire length of the overlaps, from the gutter bead to the water check.
    9. Clean the soldered joint with a damp cloth to remove flux residue and carbon
E. Attaching the gutters by soldering:
    1. Apply “ZD-proflux to the contact surfaces of the soldered joint. It shortened gutter pieces are used, be sure to debur cut edges beforehand
    2. Connect the gutter pieces with an overlap of 3/8” – 5/8”. Insert and rotate the gutter bead and lock the water check.
    3. Fasten the gutter by snapping the gutter bead onto the snap-lock bracket.
    4. Apply “ZD-pro” flux to the soldered joint overlap.
    5. Begin soldering the gutter joint at the gutter bead and exert pressure while slowly drawing the soldering iron over the joint.
    6. Continue on the soldered joint up to the water check.
    7. Clean the soldered joint with a damp cloth to remove any flux residue and carbon
    8. Inspect the soldered joint. The gutters should be joined securely and the solder should be visible on the backside throughout the entire length of the soldered joint.
F. Installing Expansion Joints:
    1. Expansion joints must be installed at a minimum interval of 50’ along the entire length of the gutter, in order to accommodate thermal expansion. Measuring from gutter miters and down spouts, an expansion joint must be installed at the half-way point 25’.
    2. Slide on the loose gutter bead cap.
    3. Join the gutter pieces with an overlap of 5/8” – 7/8”. Twist in the gutter bead and overlap the water check.
    4. Apply “ZD-pro” flux to the contact surfaces of the soldered joint.
    5. Insert the expansion joint in the center above the gutter overlap. If required, reshape the expansion joints to correspond to the gutter profile.
    6. Apply the flux to the overlap area.
    7. Draw the soldering iron slowly over the joint while applying pressure. Solder the expansion joint on both sides across the entire width.

8. Remove flux residue and carbon with a damp cloth. The expansion joint should now be securely connected and watertight.
9. Roll the gutter bead cap over the edge of the expansion joint.
10. Fasten the gutter bead cap by soldering it on one side only. The cap prevents rainwater from getting in between the expansion joint and the gutter.

G. Installing the drip edge:
1. Fasten the drip edge with roofing nails. Eave flashing pieces should overlap each other by a minimum of 2”
2. Drive-in the roofing nails at staggering locations at horizontal intervals of 4”

H. Installation of the hidden downspout hanger:
1. Once the hidden downspout hanger has been mounted, it is hardly visible. Hook in the hidden downspout hanger.
2. Mark the position of the screw, fasten screw.
3. Fasten the hidden downspout hanger onto the screw.
4. Connect the next downpipe component by sliding on the expanded pipe end.

I. Installation of elbows:
1. Slide the elbow onto the plug in outlet. The steel tabs prevent the elbow from slipping.
2. Determine the length of the piece of straight pipe so that the vertical section of downspout is a minimum of 7/8” from the wall.
3. Insert expanded end of the downspout over the elbow and add the second elbow.

J. RHEINZINK adapters
1. If downspouts without factory expanded ends are used, adapters can be used to provide the connections. Pipe ends can also be expanded by using an expanding tool.
2. Insert the downspout adapter with the expanded end toward the top
3. Insert downspout together as per usual.

END OF SECTION 07 62 00

PART 1 – GENERAL

1.1 REFERENCES

A. American Society for Testing and Materials
   1. ASTM E96 – Test Methods for Water Vapor Transmission of Materials
   2. ASTM D570 – Test Method for Water Absorption of Plastics
   3. ASTM E154 – Test Method for Water Vapor Retarders used in contact with Earth Under Concrete Slabs, on Walls or as Ground Cover
   4. ASTM D1004 – Test Method for Initial Tear Resistance of Plastic Film and Sheeting
   5. ASTM D1938 – Test Method for Tear Propagation Resistance of Plastic Film and Thin Sheeting by a Single-Tear Method
   6. ASTM D1876 – Test Method for Peel Resistance of Adhesives
   7. ASTM D1970 – Standard Specifications for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
   8. D412 – Test Methods for Vulcanized Rubber & Thermoplastic Rubbers and Thermoplastic Elastomers – Tension

1.2 USAGE

A. Grace Vycor Plus is a unique solution, appropriate for working around a number of detail areas, including, but not limited to:
   1. Window and door openings (headers, sills, jambs, thresholds, nailing flanges)
   2. Deck-to-wall intersections
   3. Corner boards
   4. Wall-to-wall tie-ins
   5. Foundation sill plates
   6. Sheathing panel seams
   7. Under stucco finishes
   8. Masonry walls
   9. Other non-roof detail areas

1.3TECHNICAL DATA

A. Applicable Standards
   1. ASTM International
      a. ASTM C836 Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course
      b. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
      c. ASTM D570 Standard Test Method for Water Absorption of Plastics
      d. ASTM D903 Standard Test Method for Peel or Stripping Strength of Adhesive Bonds
      e. ASTM D1876 Standard Test Method for Peel Resistance of Adhesives (T-Peel Test)
      f. ASTM D1970 Standard Specification for Self- Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
      g. ASTM D3767 Standard Practice for Rubber- Measurement of Dimensions

1.4 PHYSICAL/CHEMICAL PROPERTIES

See Table 1 (next page)

TABLE 1 TYPICAL PHYSICAL PROPERTIES OF GRACE VYCOR PLUS SELF-ADHERED FLASHING

Property & test	Typical value
Color	Gray-Black
Thickness, ASTM D3767, Method A	25 mil (0.64 mm)
Low temperature flexibility, ASTM D1970	Unaffected at -45°F (-43°C)
Elongation, ultimate failure of rubberized asphalt, per ASTM D412	200% minimum
Cracked cycling 100 cycles per ASTM C836	Unaffected at -25°F (-32°C)
Lap adhesion at minimum application temperature, ASTM D1876 Modified	60 plf (875 N/m) width
Adhesion to concrete at minimum application temperature, ASTM D903	60 plf (875 N/m) width

PART 2 – PRODUCTS

2.1 PRODUCT DESCRIPTION

A. Grace Vycor Plus Self-Adhered Flashing is composed of durable, cross-laminated high-density polyethylene sheet, backed by an aggressive pressure-sensitive rubberized asphalt adhesive.
B. Grace Vycor Plus is available in a range of widths: 100 mm (4 in.), 150 mm (6 in.), 225 mm (9 in.), 300 mm (12 in.) and 450 mm (18 in.) to accommodate a variety of job requirements.
C. RIPCORD is available in 150 mm (6 in.), 225 mm (9 in.) and 300 mm (12 in.) wide membranes.

2.2 BASIC USE

A. Grace Vycorª Plus Self-Adhered Flashing is a self-sealing, fully adhered, composite flexible flashing designed to protect critical non-roof details from air, water and moisture infiltration. It provides an excellent positive seal around the outside and inside of doors and windows and can be used to seal joints, seams, holes and other undesirable openings in wall systems.

2.3 COMPOSITION & MATERIALS

A. Grace Vycor Plus Self-Adhered Flashing is a 25 mil (0.64 mm), cold applied, self-adhering membrane consisting of a 3 mil (0.07 mm) high density, cross-laminated polyethylene film coated on one side with a 22 mil (0.56 mm) layer of rubberized asphalt adhesive. For ease of application, the rolls are interwound with a disposable silicone coated release sheet. The flashing is a dark gray-black.
B. Grace Vycor Plus Self-Adhered Flashing is now available with RIPCORD«, a cord embedded in the adhesive layer that allows split release on demand. RIPCORD makes the membrane installation faster and easier and enables proper integration with the other waterproofing elements of the wall system.
C. Priming is generally not required for most substrates provided they are clean and dry. However, on concrete, masonry and DensGlass Goldª apply Perm-A-Barrierª WB Primer. If adhesion is found to be marginal, also prime wood composition and gypsum sheathing with Perm-A-Barrier WB Primer. The coverage rate for Perm-A-Barrier WB Primer is 250 - 350 ft2/gal (6 - 8 m2/L).

2.4 SIZES

A. Grace Vycor Plus Self-Adhered Flashing is available in 75' (22.9 m) rolls in widths of 4", 6", 9" and 12" (100, 150, 225 and 300 mm). The 4" (100 mm) width is packaged 18 rolls per carton; the 6" (150 mm) is packaged 12 rolls per carton; and the 9" and 12" (225 and 300 mm) are packaged 6 rolls per carton.

2.5 LIMITATIONS

A. Grace Vycor Plus Self-Adhered Flashing must not be applied in areas where it will be permanently exposed to sunlight, and must be covered within a reasonable amount of time not to exceed 30 days. Grace Vycor Plus should not be used in hot desert areas in the southwestern United States.
B. The following sealants are chemically compatible with the adhesive side of Grace Vycor Plus Self-Adhered Flashing if the specific formulation does not contain hydrocarbon solvents: silicone, acrylic, butyl, 1-part polyurethane and 2-part polyurethane. This flashing is incompatible with creosote; joint sealants containing polysulfide polymer or hydrocarbon solvents; products manufactured from EPDM

and flexible PVC; and certain caulks. For more information, refer to Technical Letter 1, “Chemical Compatibility with Other Building Materials and Sealants.”

C. Grace Vycor Plus Self-Adhered Flashing is designed for NON-ROOF flashing applications. The membrane is slippery - do not use on the roof. DO NOT walk on the membrane.

2.6 AVAILABILITY

A. A nationwide network of distributors carries Grace Vycor Plus Self-Adhered Flashing products. Contact a Grace Construction Products representative for ordering and delivery information.

2.7 COST

A. Grace Vycor Plus Self-Adhered Flashing is competitively priced. For specific information, contact a Grace Construction Products representative.

PART 3 - EXECUTION

3.1 STORAGE

A. Comply with manufacturer’s recommendations for storage and handling of each product

B. Protect materials from rain and physical damage. Pallets of Grace Vycor Plus Self-Adhered Flashing should not be double stacked on the jobsite. Provide cover on top and all sides, allowing for adequate ventilation. Store this product in its original, unopened packaging at ambient temperatures between 40 - 90 degrees F (5 – 32 degrees C), under dry conditions and away from exposure to direct sunlight. Store all products in a dry area away from high heat, flames or sparks. Store only as much material at point of use as is required for each day’s work.

3.2 ENVIRONMENTAL CONDITIONS

A. Grace Vycor Plus Self-Adhered Flashing cannot be applied to moist or damp surfaces. After precipitation, allow a minimum of 24 hours for drying before installing the flashing. Grace Vycor Plus Self-Adhered Flashing can be applied at air and surface temperature of 25 degrees F (-4 degrees C) and above.

3.3 APPLICATION METHODS/INSTRUCTIONS

A. Surface Preparation Substrate must be smooth, clean, dry and free of voids, spalled areas, loose substrate, loose nails, other sharp protrusions or other matter that will hinder the adhesion or regularity of the flashing installation. Clean loose dust or dirt from the surface wherever Grace Vycor Plus Self-Adhered Flashing is to be applied by wiping with a clean dry cloth or brush. If the flashing does not adhere properly to the substrate, apply Perm-A-Barrier WB Primer at a coverage rate of 250 - 350 ft2/gal (6 - 8 m2/L).

B. Allow primer to dry completely, approximately 1 hour depending on weather conditions, before application of flashing. Excess primer will not improve the adhesion of the flashing. The primer is considered dry when the substrate returns to its original color, minimum 1 hour. If primed areas are not covered that day, reprime area if there is significant dust or dirt contamination.

3.4 SURFACE PREPARATION

A. Apply Grace Vycor Plus only in fair weather when the air, surface and membrane are at temperatures of -4°C (25°F) or higher.

B. Install directly onto a clean and dry surface. Some compatible substrates include wood, plywood, oriented strand board, metal, concrete and masonry. Remove dust, dirt, and loose nails. Protrusions must be removed. Surfaces shall have no voids, damaged, or unsupported areas. Repair surfaces before installing the membrane.

C. Priming is generally not required for most substrates provided they are clean and dry. However, on concrete, masonry and DensGlass Gold®, apply Perm-A-Barrier® WB Primer. If adhesion is found to be marginal, prime wood composition and gypsum sheathing also with Perm-A-Barrier WB Primer. The coverage rate for Perm-A-Barrier WB Primer is 6-8 m2/L (250-350 ft2/gal).

3.5 MEMBRANE INSTALLATION

A. Using the 150 mm (6 in.) and 300 mm (12 in.) measurement markings, cut the membrane to the desired length. Peel back the release paper to expose the adhesive. Align the membrane and press into place with heavy hand pressure.
B. Laps must be a minimum of 75 mm (3 in.). Mechanically fasten the membrane at all vertical terminations. Use only smooth shank fasteners.
C. Consistent with good construction practice, install the membrane such that all laps shed water (following the shingle principle). The top membrane layer should go over the bottom layer. Always work from the low point to the high point. When needed, use RIPCORD to split the release paper and adhere half of the membrane, while leaving the other half with the paper on. This is required, when flashing a window sill before the housewrap/weather resistive barrier is installed.

3.6 FLASHING APPLICATION

A. General: Install flashing to dry surfaces at air and surface temperatures of -4ºC (25ºF) and above in accordance with manufacturer's recommendations at locations indicated on Construction Documents.
B. Install the membrane following the shingle principle: Apply the top membrane layer over the bottom layer so that the system sheds water. For ease of installation, Grace Vycor Plus Self-Adhered Flashing has measure markings at 6" and 12" (152 and 305 mm) intervals. Cut Vycor Plus into appropriate lengths.
C. Use RIPCORD to split the release paper and adhere half of the membrane, if necessary. Peel release paper from roll to expose rubberized asphalt and position flashing to center over joint location before applying. Move along opening or joint, being careful to put flashing as evenly as possible over the opening and avoiding fishmouths along the edges. Roll flashing firmly into place to ensure continuous and intimate contact with the substrate.
D. If wrinkles develop, carefully cut out affected area and replace in the similar procedure outlined above. The repair piece also must be pressed into place as soon as possible to ensure continuous and intimate contact with the substrate.
E. Grace Vycor Plus Self-Adhered Flashing must be continuously supported by the substrate and must not span or bridge joints, gaps or voids in excess of 1/4" (6.4 mm). End laps that occur in subsequent lengths must maintain a minimum overlap of 3" (75 mm).

3.7 PRECAUTIONS AND LIMITATIONS

A. Grace Vycor Plus is designed for critical NON-ROOF flashing details. The membrane is slippery – DO NOT install on the roof; DO NOT walk on the membrane.
B. Do not leave the product permanently exposed to sunlight. Maximum recommended exposure time is 30 days. Due to its slight asphaltic odor, apply this product where the membrane is not exposed to interior living space. Grace Vycor Plus should not be used in hot desert areas in the Southwestern United States.
C. Grace Vycor Plus is not compatible with flexible PVC. Contact window manufacturer for specific application instructions required when using a bituminous-based flashing. Certain metal window applications with integral nail fin may have specific limitations. Some solvents in certain caulking may be incompatible with the adhesive in Grace Vycor Plus.

3.8 PROTECTION

A. Grace Vycor Plus Self-Adhered Flashing must be protected from damage from other trades or construction materials.

3.9 SAFETY, STORAGE & HANDLING

A. Grace Vycor Plus Self-Adhered Flashing products must be handled properly. The best information on safe handling, storage, personal protection, health and environmental considerations has been gathered. Material Safety Data Sheets (MSDS) are available from the manufacturer upon request. All

users must acquaint themselves with this information. Carefully read detailed precaution statements on product labels and MSDS before use.

3.10 WARRANTY

A. Grace Vycor Plus Self-Adhered Flashing is warranted at the time of shipment to meet Grace's published specifications.

3.11 MAINTENANCE

A. Grace Vycor Plus Self-Adhered Flashing, when installed in accordance with manufacturer's recommendations, will not require maintenance.

PRODUCT DATA

Property	Grace Vycor Plus			
Product Thickness	0.64 mm (25 mil)			
Carrier Film	Cross-laminated HDPE			
Adhesive	Rubberized Asphalt			
Release Liner	Paper			
Color	Gray-Black			
Recommended Exposure Limit	30 Days			
Roll Width(s)	100 mm (4 in.)	150 mm (6 in.)	225 mm (9 in.)	300 mm (12 in.)
Roll Length(s)	22.9 m (75 ft)	22.9 m (75 ft)	22.9 m (75 ft)	22.9 m (75 ft)
Rolls per Carton	18	12	6	6
Shipping Weight	33 kg (74 lbs)	33 kg (74 lbs)	25 kg (56 lbs)	33 kg (74 lbs)
Cartons per Pallet	30	30	30	30

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85761 MSDS Date: 05/02/2006

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Waterproofing Membrane
MSDS Number:	M-85761
Cancelled MSDS Number:	M-85757
MSDS Date:	05/02/2006
Chemical Family Name:	Rubberized Asphalt Adhesive Sheet with Film and/or Mesh Comprising Various Components.
Product Use:	Waterproofing Membrane.
Chemical Formula:	Mixture-NA
CAS # (Chemical Abstracts Service Number):	Mixture-NA

Manufactured by:

W.R.Grace & Co.-Conn.
62 Whittemore Avenue
Cambridge, MA 02140

Grace Canada, Inc.
294 Clements Road West
Ajax, Ontario L1S 3C6

In Case of Emergency Call:
In USA: (617) 876-1400 In Canada: (905) 683-8561

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient	CAS#	Percent (max)
Heavy Paraffinic Distillate Solvent Extract	064742-04-7	10-25
Petroleum Asphalt	008052-42-4	50-100
Styrene-Butadiene block copolymer	009003-55-8	10-25

SECTION 3 - HAZARDS IDENTIFICATION

Emergency Overview:

Warning!
Eye contact with rubberized asphalt residue on hands can cause irritation.
Skin contact with rubberized asphalt can cause irritation.
May be harmful if ingested.
May be harmful if absorbed through skin.
May cause teratogenic effects.
May produce local skin tumors.
Removal of release liner may generate a static electrical discharge (spark).
Release liners are slippery. Remove from work area immediately.

HMIS Rating:

Health:	2*
Flammability:	1
Reactivity:	0
Personal Protective Equipment:	B (See Section 8)

Potential Health Effects:

Inhalation: Due to the physical nature of this product, inhalation is unlikely.
If heated, inhalation of vapor causes irritation, sore throat, coughing and breathing difficulty.
Effects include: Nausea, headache, dizziness and irritation.
Eye Contact: Eye contact with rubberized asphalt residue on hands can cause irritation
Skin Contact: Skin contact causes irritation.
Prolonged skin contact can result in dermatitis.
Contact with petroleum oils in this product, may produce serious toxic effects including skin cancer, liver damage, blood effects and effects on the unborn based on tests with laboratory animals. Animal tests indicate that prolonged and repeated skin contact to the oils in this product may produce local skin tumors.

Individuals with pre-existing skin disorders may be at increased risk for worsening their condition from exposure to this product.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85761 MSDS Date: 05/02/2006

Skin Absorption: Product can be absorbed through the skin upon prolonged contact resulting in systemic effects such as nausea, headache, and general discomfort.
Ingestion: Due to the physical nature of this product, ingestion is unlikely.
If ingested, causes burns to the linings of the mouth, esophagus and stomach.
Effects include: Nausea, vomiting and diarrhea.
Wash hands before eating.

SECTION 4 - FIRST AID MEASURES:

Skin Contact: In case of skin contact, clean fingernails and wash skin with soap and water. If residue remains, clean with waterless hand-cream or abrasive soap. Never use solvents.
If discomfort or irritation persists, consult a physician.
Remove contaminated clothing and wash before reuse.
Eye Contact: Flush eyes with water for at least 15 minutes while holding eyelids open.
Get immediate medical attention.
Ingestion: If swallowed, contact a physician immediately.
Never give anything by mouth to an unconscious person.
The decision to induce vomiting should only be made by a physician.
Inhalation: If symptoms develop, get fresh air. If symptoms persist, consult a physician.
If breathing has stopped, give artificial respiration then oxygen if needed.
Get immediate medical attention.

SECTION 5 - FIRE AND EXPLOSION HAZARD DATA

Flash Point:	>210C (>410F)
Flash Point Method:	Open Cup
Lower Explosion Limit:	Not Available
Upper Explosion Limit:	Not Available
Auto-Ignition Temperature:	Not Available

NFPA Rating:

Health:	1
Flammability:	1
Reactivity:	0

Extinguishing Media: In case of fire, use water spray, dry chemical, Carbon dioxide or foam.
Special Fire Fighting Procedures:
Wear self-contained breathing apparatus and complete personal protective equipment when potential for exposure to vapors or products of combustion exist. Avoid breathing hazardous vapors or products of combustion, keep upwind. Isolate area and keep unnecessary people away. Prevent run-off from fire control or dilution from entering streams or drinking water supplies.
Unusual Fire and Explosion Hazards: None unless noted below.
Removal of release paper may create a static electric discharge (sparks). Do not remove where sparks may ignite flammable vapors.

SECTION 6 - ACCIDENTAL RELEASE MEASURES:

Spills/Leaks: Due to the physical nature of this product, spills are not possible.

SECTION 7 - HANDLING AND STORAGE

Precautionary Measures: Avoid contact with eyes, skin and clothing.
Practice good personal hygiene to avoid ingestion.
Use only with adequate ventilation.
Wash clothing before reuse.

Slippery when wet or covered with frost.
Do not apply where membrane odors may penetrate living areas.
To avoid skin contact, use gloves or barrier creams. Promptly cleanse hands with waterless hand cleaner, clean fingernails and wash with soap and water after handling.
Release liners are slippery. Remove from work area immediately after membrane application.
Consistent with good roofing practice, always wear fall protection when working on roof decks.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85761 MSDS Date: 05/02/2006

FOR PROFESSIONAL USE ONLY. KEEP OUT OF CHILDREN'S REACH.

SECTION 8 -EXPOSURE CONTROLS AND PERSONAL PROTECTIVE EQUIPMENT

EXPOSURE GUIDELINES (US)

Ingredient	ACGIH TLV			OSHA PEL			Other
	TWA	STEL	Ceiling	TWA	STEL	Ceiling	
Heavy Paraffinic Distillate Solvent Extract	-	-	-	-	-	-	-
Petroleum Asphalt	0.5 mg/m3 TWA (inhalable fraction); (as benzene-soluble aerosol)	-	-	-	-	-	-
Styrene-Butadiene block copolymer	-	-	-	-	-	-	-

EXPOSURE GUIDELINES (CANADA)

Employers should consult local Provincial regulatory limits for exposure guidelines, which may vary locally.

Engineering Controls: **Not generally required.**

Personal Protective Equipment:

Respiratory Protection: Respiratory protection is not generally required. If exposure limits are exceeded, wear approved respiratory protection.
Skin Protection: Use oil impervious gloves to avoid prolonged or repeated contact with rubberized asphalt residue. Eye Protection: Not required for normal use.
Work/Hygienic Practices: Use good personal hygiene practices. Avoid rubbing eyes while handling. Due to the physical nature of this product, ingestion is unlikely. Incidental ingestion of residue on hands can be avoided by using good personal hygiene practices. This product contains compounds subject to exposure guidelines and/or identified as carcinogens. (See Sections 8 and 11). However, due to the physical nature of this product, these compounds are unlikely to reach exposure limits unless airborne dust or spray mist is created. To avoid skin contact, wear recommended gloves (see skin protection recommendation) and wash with soap and water after handling. Intermittent or occasional skin contact with petroleum asphalt is not expected to have serious health effects as long as good personal hygiene measures are taken. Promptly cleanse with waterless hand cleaner, clean fingernails and wash with soap and water after handling. All employees working with this product must exercise good and prudent personal hygiene practices.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Solid sheet
Appearance/Odor:	A black, rubberized asphalt adhesive layer on a grey/black plastic sheet with a paper or plastic release sheet. Petroleum odor.
Odor Threshold: (ppm)	Unknown
pH:	Not Applicable
Vapor Pressure: (Mm Hg)	Not Applicable
Vapor Density: (Air = 1)	Not Applicable
Solubility In Water:	Negligible
Specific Gravity: (Water = 1)	1.0 - 1.1
Evaporation Rate: (Butyl Acetate = 1)	Not Applicable
Boiling Point:	Not Applicable
Viscosity:	Not Available
Bulk Density: (Pounds/Cubic Foot)(Pcf)	~70

% Volatiles (gr/L): (70°F) (21°C) Negligible

SECTION 10 - STABILITY AND REACTIVITY

Chemical Stability: Stable
Conditions To Avoid: Heat, Oxidizing materials, Strong oxidizers and Water.
Hazardous Polymerization: Will not polymerize.
Hazardous Decomposition Products: Carbon dioxide, Carbon monoxide, Sulfur oxides and Low molecular weight hydrocarbons.

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85761 MSDS Date: 05/02/2006

SECTION 11 - TOXICOLOGICAL INFORMATION

Ingredient(No data unless listed.) CAS Number LD50 and LC50

Carcinogenicity:

Ingredient	IARC Group 1	IARC Group 2A	IARC Group 2B	NTP Known	NTP Suspect	OSHA
Heavy Paraffinic Distillate Solvent Extract	Yes	No	No	No	No	Yes
Petroleum Asphalt	No	No	Yes	No	No	No
Styrene-Butadiene block copolymer	No	No	No	No	No	No

Animal tests indicate that prolonged and repeated skin contact with the asphalt in this product may produce local skin tumors.

Mutagenicity: Not applicable.
Teratogenicity: Petroleum oils in this product have caused effects on the unborn based on tests with laboratory animals.
Reproductive Toxicity: Not applicable.

SECTION 12 - ECOLOGICAL INFORMATION

Environmental Fate: No data available for product.
Ecotoxicity: No data available for product.

SECTION 13 - DISPOSAL CONSIDERATIONS

Waste Disposal Procedures: Consult all regulations (federal, state, provincial, local) or a qualified waste disposal firm when characterizing waste for disposal. According to EPA (40 CFR § 261), waste of this product is not defined as hazardous. Dispose of waste in accordance with all applicable regulations.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Not Applicable
UN/NA Number: Not Applicable
Domestic Hazard Class: Nonhazardous
Surface Freight Classification: Asphalt Mixture, N.O.I.B.N.
Label/Placard Required: Not Applicable

SECTION 15 - REGULATORY INFORMATION

REGULATORY CHEMICAL LISTS:

CERCLA (Comprehensive Response Compensation and Liability Act):
(None present unless listed below)

Chemical Name CAS # Wt % CERCLA RQ

SARA Title III (Superfund Amendments and Reauthorization Act)

SARA Section 312/Tier I & II Hazard Categories:

Health Immediate (acute) Yes
Health Delayed (chronic) Yes
Flammable No

Reactive	No		
Pressure	No		
302 Reportable Ingredients (Identification Threshold 1%.):			
Chemical Name	CAS #	Wt %	SARA 302 TPQ
313 Reportable Ingredients (Chemicals present below reporting threshold are exempt):			
Chemical Name	CAS #	Wt %	
National Volatile Organic Compound Emission Standards For Architectural Coatings:			
Volatile Organic Content: (gr/L)		Not Applicable	
WHMIS Classification(s):		D2 B	

W. R. GRACE
MATERIAL SAFETY DATA SHEET

Product Name: Waterproofing Membrane
MSDS ID Number: M-85761 MSDS Date: 05/02/2006
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR). This MSDS contains all the information required by the CPR.

State Regulatory Information: California Proposition 65: This product contains substances known to the state of California to cause cancer, birth defects or other reproductive harm.

Massachusetts Hazardous Substance List(Identification threshold 0.001%(1ppm)):

Chemical Name	CAS #	Wt %
Heavy Paraffinic Distillate Solvent Extract	064742-04-7	21

New Jersey Hazardous Substance List(Identification threshold (0.1%)):

Chemical Name	CAS #	Wt %

Pennsylvania Hazardous Substance List(Identification threshold 0.01%):

Chemical Name	CAS #	Wt %

CHEMICAL INVENTORY STATUS:

All chemicals in this product are listed or exempt from listing in the following countries:

US	CANADA		EUROPE	AUSTRALIA	JAPAN	KOREA	PHILIPPINES
TSCA	DSL	NDSL	EINECS/ELINCS	AICS	ENCS	ECL	PICCS
Yes	Yes	No	Yes	Yes	Not Determined	Yes	Yes

SECTION 16 - OTHER INFORMATION

BITUTHENE® WATERPROOFING MEMBRANE 3000, 5000, 9004, 9016, 5004, 4008, 2000, 6000
BITUTHENE® WATERPROOFING MEMBRANE 374, CP
BITUTHENE® WATERPROOFING MEMBRANE STRIPS 3000, 5000, 3000-90
BITUTHENE® LOW TEMPERATURE WATERPROOFING MEMBRANE, MEMBRANE STRIPS
BITUTHENE® SYSTEM 4000 WATERPROOFING MEMBRANE, MEMBRANE STRIPS
PERM-A-BARRIER® WALL FLASHING, PERM-A-BARRIER® WALL MEMBRANE, PERM-A-BARRIER® LOW TEMPERATURE MEMBRANE, PAB SYSTEM 4000, PAB DETAIL TAPE, GRACE ICE & WATER SHIELD®, PRMA MEMBRANE GRACE ROOF DETAIL MEMBRANE, INSULWRAP P-300, P-400, P-460 AND P-500, PITTWRAP CW GRACE® SELECT, VYCOR® V40 WEATHER BARRIER STRIPS, GRACE VYCOR PLUS TAPES GRACE® BASIK™ BITUSTIK™, HATCH TAPE, GRACE VYCOR DECK PROTECTOR, GRACE VYCOR ALL PURPOSE FLASHING

Non-Hazardous Ingredient Disclosure:

Chemical Name	CAS Number

Prepared by: EH&S Department
Approved by: EH&S Department
Approved Date: 05/02/2006

Disclaimer:
"The data included herein are presented in accordance with various environment, health and safety regulations. It is the responsibility of a recipient of the data to remain currently informed on chemical hazard information, to design and update its own program and to comply with all national, federal, state and local laws and regulations applicable to safety, occupational health, right-to-know and environmental protection."

MATERIAL SAFETY DATA SHEET
DuPont Tyvek® Tape

Revised: August 88
Issued: July 85

I. IDENTIFICATION

Product: All DuPont Tyvek tapes

II. PHYSICAL DATA

Solubility in water: Negligible
Volatility at 100^{0}C: Less than 0.1%

III. HAZARDOUS INGREDIENTS

None

IV. FIRE AND EXPLOSION HAZARD DATA

Flashpoint: Not applicable
Flammable limits: Not applicable
Extinguishing media: Water, dry chemicals, foam, CO_2
Unusual fire hazards: Produces dense black smoke if burned

V. HEALTH HAZARD DATA

Skin Contact: May cause skin irritation after prolonged exposure with adhesive side to skin

No other effect on health is known.

VI. REACTIVITY DATA

Not Reactive
Exposure to temperatures in excess of 200^{0}C (392^{0}F) cause decompositions

VII. SPILL OR LEAK PROCEDURES

Not Applicable

VJJ. SPECIAL PROTECTION INFORMATION

Not Applicable

Date of Issue: _____September 3, 2003_ Prepared by: _____
Ronald M. Jacobs, Director Marketing & Sales

CANTECH INDUSTRIES, INC.
P. O. BOX 1432 JOHNSON CITY, TN 37605-1432
2222 EDDIE WILLIAMS ROAD JOHNSON CITY, TN 37601-2871

TEL: 423-928-8331 WAT: 800-654-3947 FAX: 423-928-0311
WEBSITE: www.cantechtape.com E-MAIL: cii@cttgroup.com

END OF SECTION 07 65 00

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Limit use of sealants through proper detailing. Do not rely on sealants only; use mechanical means and gravity to keep water out.
B. Avoid indoor use of sealants that may contribute to indoor air quality problems. Sealant types to avoid indoors are listed here with the potential harmful emissions from each in parentheses:
   1. Butyl rubber (aliphatic hydrocarbons)
   2. Solvent-based acrylic (xylene)
   3. Neoprene (xylene)
   4. Styrene butadiene rubber (various VOCs: hexane, toluene, and xylene, depending on type)
   5. Nitrile (various VOCs: hexane, toluene, and xylene, depending on type)
   6. Any products containing methylene chloride or chlorinated hydrocarbons
   7. Any products containing bactericides and fungicides classified as phenol mercury acetates, phenol phenates, or phenol formaldehyde
C. Sealants that are generally acceptable for indoor use (with potential emissions) are:
   1. Oleoresinous (small amounts of aliphatic hydrocarbons)
   2. Acrylic emulsion latex (water-based)
   3. Polysulfide (small amounts of toluene vapors)
   4. Polyurethane (small amounts of xylene and other solvents)
   5. Silicone (small amounts of xylene and other solvents)

1.2 SUBMITTALS

A. Provide a cut sheet and/or material safety data sheet (MSDS) for every sealant used within the building (not including the exterior surface of the building), with VOC levels highlighted.

PART 2 - PRODUCTS

2.1 SEALANT MATERIALS

A. Exterior General Use:
   1. Single-component polyurethane conforming to ASTM C920, Type S, Class 25, Grade NS
   2. Silicon: one-part silicon sealant, VOC content: maximum 15 grams/liter
   3. Acrylic/silicon: water-based sealant, VOC content: 31 grams/liter
B. Exterior Concealed Joints and Under Thresholds: One-part butyl rubber caulk conforming to FS TT-S-001657, Type I
C. Exterior Concealed Joints between two assembled rigid surfaces in compression: Polyisobutylene sealant tape conforming to AAMA 804.1
D. Exterior and Interior Horizontal Joints subject to pedestrian traffic:
   1. Two-part polyurethane conforming to ASTM C920, Class 25, Type M; self-leveling, zero-VOC
   2. One-part polyurethane, VOC content: maximum 45 grams/liter
E. Interior Non-wet Areas: One-component acrylic latex water-based sealant conforming to ASTM C834, VOC content: maximum 42 grams/liter
F. Interior Wet Areas: One-part, mildew-resistant silicone rubber conforming to ASTM C920, Type S, Class 25, Grade NS
G. Sealant Backer Rod: Compressible rod-stock polyethylene foam, polyethylene-jacketed polyurethane foam, butyl-rubber foam, neoprene foam, or other flexible, permanent, durable, nonabsorptive material as recommended for compatibility with sealant by sealant manufacturer
H. Joint Cleaner, Primer, and Bond Breaker: As recommended by sealant manufacturer
I. Fiber Expansion Joint Material: Preformed cellular fiber complying with ASTM D1751
J. Electrical Box Sealant: Sheet caulking
K. Tamp-in Sealants: Oakum
L. Caulking cord: Fine fiber yarn saturated with wax; contains linseed oil and talcum
M. Foam Sealants: Blown with hydrocarbon or HFC-134a [Use bulk tanks and reusable dispensing guns.]

2.2 PRODUCTS

B. BioBased 2000 NB 2.0 lb/ft3 spray foam polyurethane closed cell insulation formulated with HFC-245fa as the blowing agent.
   1. BioBased 2000 NB spray foam insulation is a two-part product installed by Certified Dealers using custom designed application equipment. When installed, BioBased 2000 NB expands to completely fill all voids to effectively seal against air infiltration—often the major source of heat/cooling loss. BioBased 2000 NB also provides superior thermal and structural performance when compared to other insulation products. BioBased 2000 NB provides superior thermal and structural performance in conventional construction when compared to other insulation products, but is especially effective in steel framed structures, metal buildings, and older homes.
   2. BioBased 2000 NB is applied by spraying liquid chemical components onto open wall, ceiling, and floor surfaces; or into wall and other cavities. When applied, the components quickly expand to make a foam layer of millions of air pockets—covering surfaces and filling cracks and voids. The foam adheres to almost all surfaces, and when cured can be trimmed off to provide a surface that is ready for drywall or other finishing.

C. BioBased 501 (0.5 lb/ft3 spray foam polyurethane semi-open celled insulation)
   3. Product Description: BioBased 501 spray foam insulation is a two-part, soy-based product installed by Certified Dealers using custom designed application equipment. When installed, BioBased 501 expands to completely fill all voids to effectively seal against air infiltration—often the major source of heat/cooling loss. BioBased 501 also provides superior acoustical and thermal performance when compared to other insulation products. While offering superior performance in conventional construction, it is especially effective in steel-framed structures, older homes and metal buildings.
   4. BioBased 501 is applied by spraying liquid chemical components onto open wall, ceiling, and floor surfaces; or into wall and other cavities. When applied, the components quickly expand to make a foam layer of millions of air pockets—covering surfaces and filling cracks and voids. The foam adheres to almost all surfaces, and when cured can be trimmed off to provide a surface that is ready for drywall or other finishing.

B. West Systems epoxy
C. Do-All-Ply
D. Firestone Sealant
E. DAPtex Plus Window and Door Foam Sealant
   1. Use of DAPtex® Plus to seal the rough opening in windows and doors that conform to AAMA (American Architectural Manufacturers Association) 101 specification will maintain the performance of the installed window or door to meet AAMA specification for air infiltration using ASTM E 283 and for water resistance using ASTM E 547 and E 331

PART 3 - EXECUTION

3.1 INSTALLATION

A. Minimize use of sealants, caulks, and adhesives through proper detailing, including adequate overhangs and eaves, flashing, and proper lapping of building paper and trim.
B. Use oakum to seal around penetrations where feasible.
C. Use dry adhesive sealant tape instead of wet sealants where feasible.
D. BioBased 501 is installed by certified technicians that specialize in the installation of soy-based spray foam. Application of the product can generally occur independent of environmental conditions—it can be installed in hot, humid, or freezing conditions—and surface preparation is generally not necessary. Once BioBased 501 has been sprayed, curing takes only a few seconds.
E. BioBased 2000 NB must be installed only by certified technicians specializing in the installation of spray foam and who are fully familiar with the MSDS's, product labels, and all related safety and handling instructions.
F. BioBased 2000 NB is a fast reacting 2.0 lb/ft3 density spray foam system designed to be processed on

substrates that are clean, dry, and free of moisture or frost. All metal substrates must be free of oil and grease, and should be properly primed.

G. Do-All-Ply:
   A. If adhering directly to wall, remove excess mortar and other high areas from wall surface. For 4' x 8' EPS board size, apply Do-All-Ply around entire outer area (approximately 2" from edge), plus run a bead from top to bottom on left and right side, both about 18" in from edge. After placement of foam, allow to cure for 48 hours before covering with other materials.
   B. When using enclosed areas or where surface temperatures exceed 90o F prior to curing, it is recommended that the Do-All-Ply be "flashed" off (foams placed and pulled away and then reset) to prevent solvent and vapor build-up. Provide proper ventilation of all work areas.
   C. Clean up excess product and tools with mineral spirits or any type of commercial paint thinner, following solvent manufacturers' precautions.
   D. Approximate Coverages:
      i. 3/8" Bead dispensed from 28 oz. tube = 38 lineal feet
      ii. 1/4" V-notched trowel = 50 square feet per gallon

H. DAPtex Plus Window and Door Foam Sealant:
   A. Product is EXTREMELY FLAMMABLE WHEN DISPENSING! Refer to Material Safety Data Sheet and product label for additional information.
   B. Extinguish all ignition sources during use and cure.
   C. Wear safety glasses and use in well-ventilated areas.
   D. Clean and remove grease, dirt and debris from application area.
   E. Shake can vigorously for 1 minute before use.
   F. Push straw into nozzle located above the trigger and remove safety tab above trigger.
   G. Slowly pull trigger to dispense foam from upright can, filling 90% to allow for minimal expansion.
   H. Foam can be tooled or shaped while wet.
   I. For exterior applications, foam must be painted with a quality latex paint after fully cured.
   J. If storing for reuse, remove straw from nozzle and clean both with warm water. Cured foam can be removed from nozzle or straw with a pipe cleaner or paper clip.
   K. Not recommended for use at or below grade, or for closed cavities. For gaps more than 2” deep, use multiple layers of 1/2” - 1”, allowing 24 hours to dry between each application.

3.2 STORAGE

A. Store BioBased 2000 NB between 50 degrees and 75 degrees Fahrenheit
B. Store BioBased 501 between 60 degrees and 90 degrees Fahrenheit.
C. Refer to Material Safety and Data Sheets

3.3 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan.
B. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.
C. Place used sealant tubes and containers in areas designated for hazardous materials.

Material Safety Data Sheet

24 Hour Emergency Phone Numbers:
Medical: 1-800-327-3874
1-513-558-5111
Transportation:
1-800-535-5053
1-352-323-3500

NOTE: National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

IMPORTANT: Read this MSDS before handling or disposing of this product, and provide this information to the employees, customers, and users of this product. This product is covered by the OSHA Hazard Communication Standard and this document has been prepared in accordance with requirements of this standard. All abbreviated terms used in this MSDS are further described in Section 16.

Section 1 - Chemical Product / Company Information

This Material Safety Data Sheet is available in Canadian French and Spanish upon request.
Esta hoja de datos de la seguridad de los materiales está disponible en francés canadiense y en español a su solicitud.
Los Datos de Serguridad del Producto pueden obtenerse en Espanol si lo riquiere.

Product Name: DAPTex® Plus Window&Door FoamSealant

Revision Date: 02/12/2004
Supercedes: 02/12/2004

Product Use/Class: Pressurized Latex Foam

MSDS Number: 00077344003

Manufacturer: **DAP Inc.**
2400 Boston Street Suite 200
Baltimore, MD 21224-4723
888-327-8477 (non-emergency matters)

Section 2 - Composition / Information On Ingredients

Chemical Name	CASRN	WT%	ACGIH TWA	ACGIH STEL	ACGIH CEIL	OSHA TWA	OSHA STEL	OSHA CEIL	Skin
Isopropyl alcohol	67-63-0	1-5	200 PPM	400 PPM	N.E.	400 PPM	N.E.	N.E.	No
Ethylene glycol	107-21-1	1-5	N.E.	N.E.	100 MGM3	N.E.	N.E.	N.E.	No
Dimethyl ether	115-10-6	1-5	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	No
Propane	74-98-6	1-5	2500 PPM	N.E.	N.E.	1000 PPM	N.E.	N.E.	No
n-Butane	106-97-8	1-5	800 PPM	N.E.	N.E.	N.E.	N.E.	N.E.	No
Vinyl acetate	108-05-4	0.1-1.0	10 PPM	15 PPM	N.E.	N.E.	N.E.	N.E.	No
Aliphatic amines	Proprietary	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.	N.E.

Exposure Notes:

Important: Listed Permissible Exposure Levels (PEL) are from the U.S. Dept. of Labor OSHA Final Rule Limits (CFR 29 1910.1000); these limits may vary between states.

Note: An employee's skin exposure to substances having a "YES" in the "SKIN" column in the table above shall be prevented or reduced to the extent necessary under the circumstances through the use of gloves, coveralls, goggles or other appropriate personal protective equipment, engineering controls or work practices

Section 3 - Hazards Identification

Emergency Overview: A white to off-white gel with a slight alcoholic odor. DANGER! Contents under pressure.

Harmful if swallowed or absorbed through the skin. Do not puncture can. Vapors harmful if inhaled. May cause eye, skin, nose, throat and respiratory tract irritation. This product contains ethylene glycol. Exposure to temperatures above 120 °F may cause can to rupture.

Refer to other MSDS sections for other detailed information.

Effects Of Overexposure - Eye Contact: May cause eye irritation.

Effects Of Overexposure - Skin Contact: May cause skin irritation. Prolonged or repeated contact with skin may cause irritation. Harmful if absorbed through the skin.

Effects Of Overexposure - Inhalation: Harmful if inhaled. Causes nose and throat irritation. Inhalation may cause irritation to the respiratory tract (nose, mouth, mucous membranes). Vapor harmful. May affect the brain or nervous system causing dizziness, headache or nausea.

Effects Of Overexposure - Ingestion: Harmful or fatal if swallowed. Ingestion of ethylene glycol can cause gastrointestinal irritation, nausea, vomiting, diarrhea, depressed respiration and if ingested in sufficient quantities, death.

Effects Of Overexposure - Chronic Hazards: This product contains vinyl acetate which is classified as a class 2B carcinogen by IARC. Vinyl acetate was found to cause cancer in the respiratory tract of laboratory animals. There is no evidence that vinyl acetate causes cancer in humans. The IARC published a monograph on vinyl acetate (1995). In this monograph, IARC indicates "there is inadequate evidence in humans for carcinogenicity of vinyl acetate. There is limited evidence in experimental animals for the carcinogenicity of vinyl acetate." Normally, this lack of conclusive evidence would place a substance in the IARC 3 classification (not classified as a human carcinogen). However, because vinyl acetate is metabolized to acetaldehyde, which has an IARC 2B (possibly carcinogenic to humans) classification, it also has been listed under Category 2B.

Studies have shown that repeated inhalation of ethylene glycol has produced adverse cardiovascular changes in laboratory animals. Overexposure may cause kidney, cardiovascular, skin and liver damage. Ethylene Glycol may cause kidney and liver damage upon prolonged and repeated overexposures. Ethylene glycol has been shown to cause birth defects in laboratory animals.

NOTICE: Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal. Repeated or prolonged exposure may cause respiratory system damage. Prolonged and repeated skin contact may cause irritation and possibly dermatitis.

Primary Route(s) Of Entry: Skin Contact, Skin Absorption, Inhalation, Eye Contact

Medical Conditions which May be Aggravated by Exposure: None known.

Section 4 - First Aid Measures

First Aid - Eye Contact: In case of contact, immediately flush eyes with large quantities of water for at least 15 minutes until irritation subsides. Get medical attention immediately.

First Aid - Skin Contact: Wash off immediately with soap and plenty of water. Remove and wash contaminated clothing.

First Aid - Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

First Aid - Ingestion: If swallowed, DO NOT INDUCE VOMITING. Get medical attention immediately.

Note to Physician: No Information.

COMMENTS: Call Medical Emergency at 1-800-327-3874 if any irritation or complication arise from any of the above routes of entry.

Section 5 - Fire Fighting Measures

Flash Point, F: Aerosol (Extremely Flammable)
Method: (Not Applicable)

Lower Explosive Limit, %: Not Established

Upper Explosive Limit, %: Not Established

Extinguishing Media: Carbon Dioxide, Dry Chemical, Foam, Water Fog

Unusual Fire And Explosion Hazards: Do not smoke. Extinguish all flames and pilot lights, and turn off stoves, heaters, electric motors and other sources of ignition during use and until all vapors are gone. Containers may explode if exposed to extreme heat. Store away from caustics and oxidizers.

Special Firefighting Procedures: Wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent) and full protective gear. Use water spray to cool exposed surfaces.

Section 6 - Accidental Release Measures

Steps To Be Taken If Material Is Released Or Spilled: Wear proper protective equipment as specified in Section 8. Use absorbent material or scrape up dried material and place in container.

Section 7 - Handling And Storage

Handling: KEEP OUT OF REACH OF CHILDREN! DO NOT TAKE INTERNALLY. Provide fresh air such that chemical odors cannot be detected during use and while drying. Use only with adequate ventilation. Ensure fresh air entry during application and drying. Avoid breathing vapor and contact with eyes, skin and clothing. Open all windows and doors or use other means to ensure cross -ventilation and fresh air entry during application and drying. Odor is not an adequate warning for hazardous conditions. Make sure nozzle is directed away from yourself prior to discharge. Construction and repair activities can adversely affect indoor air quality. Consult with occupants or a representative (i.e.; maintenance, building manager, industrial hygienist or safety officer) to determine ways to minimize impact. Wash thoroughly after handling. Intentional misuse by deliberately concentrating and inhaling vapors may be harmful or fatal.

Storage: Store containers away from excessive heat and freezing. Keep away from heat and sources of ignition. Protect material from direct sunlight. Store away from caustics and oxidizers. Do not store at temperatures above 120 degrees F.

Section 8 - Exposure Controls / Personal Protection

Precautionary Measures: No Information.

Engineering Controls: Good general ventilation should be sufficient to control airborne levels. Check all low areas for presence of vapor. Vapors are heavier than air and may spread along floors. Ensure adequate ventilation, especially in confined areas. Local ventilation of emission sources may be necessary to maintain ambient concentrations below recommended exposure limits. Provide sufficient general and/or local exhaust ventilation to maintain exposure below recommended exposure limit.

Respiratory Protection: In case of insufficient ventilation, wear suitable respiratory equipment. A NIOSH-approved air purifying respirator with an organic vapor cartridge or canister may be necessary under certain

circumstances where airborne concentrations are expected to exceed exposure limits. A respiratory protection program that meets the OSHA 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use. If concentrations exceed the exposure limits specified, use of a NIOSH-approved supplied air respirator is recommended. Where the protection factor is exceeded, use of a Self Contained Breathing Apparatus (SCBA) may be necessary. No personal respiratory protective equipment normally required.

Skin Protection: Rubber gloves.

Eye Protection: Goggles or safety glasses with side shields.

Other protective equipment: Not required under normal use.

Hygienic Practices: Remove and wash contaminated clothing before re-use. Wash hands before breaks and at the end of workday.

Section 9 - Physical And Chemical Properties

Boiling Range:	Not Established	**Vapor Density:**	Heavier Than Air
Odor:	Slight Alcoholic	**Odor Threshold:**	Not Established
Appearance:	White foaming liquid	**Evaporation Rate:**	Slower Than n-Butyl Acetate
Solubility in H2O:	Not Established	**Specific Gravity:**	0.998
Freeze Point:	Not Established	**pH:**	Between 7.0 and 12.0
Vapor Pressure:	Not Established	**Viscosity:**	Not Established
Physical State:	Gel		

When reported, the vapor pressure of this product has been calculated theoretically based on its constituent makeup and has not been determined experimentally.

(See section 16 for abbreviation legend)

Section 10 - Stability And Reactivity

Conditions To Avoid: Excessive heat and freezing.

Incompatibility: Incompatible with strong bases and oxidizing agents.

Hazardous Decomposition Products: Normal decomposition products, i.e.; COx, NOx.

Hazardous Polymerization: Hazardous polymerization will not occur under normal conditions.

Stability: Stable under recommended storage conditions.

Section 11 - Toxicological Information

Product LD50: Not Established **Product LC50:** Not Established

CASRN	Chemical Name	LD50	LC50
67-63-0	Isopropyl alcohol	Rat:5045 mg/kg	Rat:16000 ppm/8H
107-21-1	Ethylene glycol	Rat:4700 mg/kg	----------
106-97-8	n-Butane	----------	Rat:658 gm/m3/4H
108-05-4	Vinyl acetate	----------	Rat:11400 mg/m3/4H

Carcinogenicity:

CAS No.	Chemical Name	ACGIH	OSHA	IARC	NTP

108-05-4	Vinyl acetate	Confirmed animal carcinogen with unknown relevance to humans.	-----	Possible carcinogen.	-----

Significant Data with Possible Relevance to Humans: None

Section 12 - Ecological Information

Ecological Information: Ecological injuries are not known or expected under normal use.

Section 13 - Disposal Information

Disposal Information: Dispose of material in accordance with all federal, state and local regulations. State and Local regulations/restrictions are complex and may differ from Federal regulations. Responsibility for proper waste disposal is with the owner of the waste.

EPA Waste Code if Discarded (40 CFR Section 261): D001 (if residue remains)

Section 14 - Transportation Information

DOT Proper Shipping Name:	Consumer Commodity	**Packing Group:**	N.A.
DOT Technical Name:	N.A.	**Hazard Subclass:**	N.A.
DOT Hazard Class:	ORM-D Other regulated material	**DOT UN/NA Number:**	N.A.

Section 15 - Regulatory Information

CERCLA - SARA Hazard Category:

This product has been reviewed according to the EPA 'Hazard Categories' promulgated under Sections 311and 312 of the Superfund Amendment and Reauthorization Act of 1986 (SARA Title III) and is considered, under applicable definitions, to meet the following categories:

Immediate Health Hazard, Chronic Health Hazard, Fire Hazard, Pressurized Hazard

SARA Section 313:

This product contains the following substances subject to the reporting requirements of Section 313 of Title III of the Superfund Amendment and Reauthorization Act of 1986 and 40 CFR part 372:

Chemical Name	CAS Number
Isopropyl alcohol	67-63-0
Ethylene glycol	107-21-1
Vinyl acetate	108-05-4

Toxic Substances Control Act:

All ingredients in this product are either on TSCA inventory list, or otherwise exempt.

This product contains the following chemical substances subject to the reporting requirements of TSCA 12(B) if exported from the United States:

None

U.S. State Regulations:

New Jersey Right-to-Know:

The following materials are non-hazardous, but are among the top five components in this product:

Chemical Name	CAS Number
Non-Hazardous Polymer	Proprietary
Water	7732-18-5

Pennsylvania Right-to-Know:

The following non-hazardous ingredients are present in the product at greater than 3%:

Chemical Name	CAS Number
Non-Hazardous Polymer	Proprietary
Water	7732-18-5

California Proposition 65:

Warning: The following ingredients present in the product are known to the State of California to cause cancer:

None

Warning: The following ingredients present in the product are known to the State of California to cause birth defects or other reproductive harm.

None

Section 16 - Other Information

HMIS Ratings:

Health: 0 Flammability: 3 Reactivity: 0

VOLATILE ORGANIC COMPOUNDS, GR/LTR: 137.8 LB/GAL: 1.1 WT%: 11.3

REASON FOR REVISION:

Legend:

N.A. – Not Applicable

N.E. – Not Established

N.D. – Not Determined

VOC – Volatile Organic Compound

PEL – Permissible Exposure Limit

TLV – Threshold Limit Value

STEL – Short Term Exposure Limit

LD50 – Lethal Dose 50

ACGIH – American Conference of Governmental Industrial Hygienists

SARA – Superfund Amendments and Reauthorization Act of 1986

NJRTK – New Jersey Right-to-Know Law

OSHA – Occupational Safety and Health Administration

HMIS – Hazardous Materials Identification System

NTP – National Toxicology Program

CEIL – Ceiling Exposure Limit

LC50 – Lethal Concentration 50

F – Degree Fahrenheit C – Degree Celcius

CASRN – The Chemical Abstracts Service Registry Number MSDS – Material Safety Data Sheet

DAP believes the data and statements contained herein are accurate as of the date hereof. They are offered in good faith as typical values and not as a product specification. **NO WARRANTY OF MERCHANTABILITY, WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE WITH REGARD TO THE INFORMATION HEREIN PROVIDED OR THE PRODUCT TO WHICH THE INFORMATION REFERS.** Since this document is intended only as a guide to the appropriate use and precautionary handling of the referenced product by a properly trained person, it is therefore the responsibility of the user to (i) review the recommendations with due consideration for the specific context of the intended use and (ii) determine if they are appropriate.

<End of MSDS>

MATERIAL SAFETY DATA SHEET
West System Inc.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:.....WEST SYSTEM® 105™ Epoxy Resin.
PRODUCT CODE:.....105
CHEMICAL FAMILY:.....Epoxy Resin.
CHEMICAL NAME:.....Bisphenol A based epoxy resin.
FORMULA:.....Not applicable.

MANUFACTURER:
West System Inc.
102 Patterson Ave.
Bay City, MI 48706, U.S.A.
Phone: 866-937-8797 or 989-684-7286
www.westsystem.com

EMERGENCY TELEPHONE NUMBERS:
Transportation
CHEMTREC:.....800-424-9300 (U.S.)
703-527-3887 (International)
Non-transportation
Poison Hotline:.....800-222-1222

2. COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS

INGREDIENT NAME	CAS #	CONCENTRATION
Bisphenol-A type epoxy resin	25085-99-8	> 50%
Benzyl alcohol	100-51-6	< 20%
Bisphenol-F type epoxy resin	28064-14-4	< 20%
Ethylene glycol monobutyl ether	111-76-2	< 0.3%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

HMIS Hazard Rating: Health - 2 Flammability - 1 Reactivity - 0

WARNING! May cause allergic skin response in certain individuals. May cause moderate irritation to the skin. Light yellow liquid with mild odor.

PRIMARY ROUTE(S) OF ENTRY:.....Skin contact.

POTENTIAL HEALTH EFFECTS:

ACUTE INHALATION:.....Not likely to cause acute effects unless heated to high temperatures. If product is heated, vapors generated can cause headache, nausea, dizziness and possible respiratory
irritation if inhaled in high concentrations.

CHRONIC INHALATION:.....Not likely to cause chronic effects. Repeated exposure to high vapor concentrations may cause irritation of pre-existing lung allergies and increase the chance of developing allergy symptoms to this product.

ACUTE SKIN CONTACT:.....May cause allergic skin response in certain individuals. May cause moderate irritation to the skin such as redness and itching.

CHRONIC SKIN CONTACT:.....May cause sensitization in susceptible individuals. May cause moderate irritation to the skin.

EYE CONTACT:.....May cause irritation.

INGESTION:.....Low acute oral toxicity.

SYMPTOMS OF OVEREXPOSURE:.....Possible sensitization and subsequent allergic reactions usually seen as redness and rashes. Repeated exposure is not likely to cause other adverse health effects.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Pre-existing skin and respiratory disorders may be aggravated by exposure to this product. Pre-existing lung and skin allergies may increase the chance of developing allergic symptoms to this product.

4. FIRST AID MEASURES:

FIRST AID FOR EYES.....Flush immediately with water for at least 15 minutes. Consult a physician.

FIRST AID FOR SKIN.....Remove contaminated clothing. Wipe excess from skin. Remove with waterless skin cleaner and then wash with soap and water. Consult a physician if effects occur.

FIRST AID FOR INHALATION.....Remove to fresh air if effects occur.

FIRST AID FOR INGESTION.....No adverse health effects expected from amounts ingested under normal conditions of use. Seek medical attention if a significant amount is ingested.

5. FIRE FIGHTING MEASURES:

FLASH POINT:.....>200°F (Tag Closed Cup)

EXTINGUISHING MEDIA:.....Foam, carbon dioxide (CO2), dry chemical.

SPECIAL FIRE FIGHTING PROCEDURES:

Wear a self-contained breathing apparatus and complete full-body personal protective equipment. Closed containers may rupture (due to buildup of pressure) when exposed to extreme heat.

6. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES Soak up in absorbent material or scrape up. Residual can be removed with non- flammable solvent, but solvent should be used sparingly and with appropriate precautions.

7. HANDLING AND STORAGE:

STORAGE TEMPERATURE (min./max.):.....40°F (4°C) / 120°F (49°C)

STORAGE:.....Store in cool, dry place. Store in tightly sealed containers to prevent moisture absorption and loss of volatiles. Excessive heat over long periods of time will degrade the resin.

HANDLING PRECAUTIONS:.....Avoid prolonged or repeated skin contact. Wash thoroughly after handling. Launder contaminated clothing before reuse. Avoid inhalation of vapors from heated product. Precautionary steps should be taken when curing product in large quantities. When mixed with epoxy curing agents this product causes an exothermic, which in large masses, can produce enough heat to damage or ignite surrounding materials and emit fumes and vapors that vary widely in composition and toxicity.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

EYE PROTECTION GUIDELINES:.....Safety glasses with side shields or chemical splash goggles.

SKIN PROTECTION GUIDELINES:.....Wear liquid-proof, chemical resistant gloves (nitrile-butyl rubber, neoprene, butyl rubber or natural rubber) and full body-covering clothing.

RESPIRATORY/VENTILATION GUIDELINES:

Good room ventilation is usually adequate for most operations. Wear a NIOSH/MSHA approved respirator with an organic vapor cartridge whenever exposure to vapor in concentrations above applicable limits is likely.

ADDITIONAL PROTECTIVE MEASURES:.....Practice good caution and personal cleanliness to avoid skin and eye contact. Avoid skin contact when removing gloves and other protective equipment. Wash thoroughly after handling.

OCCUPATIONAL EXPOSURE LIMITS:.....Not established for product as whole. Refer to OSHA's

Permissible Exposure Level (PEL) or the ACGIH Guidelines for information on specific ingredients.

9. PHYSICAL AND CHEMICAL PROPERTIES:

PHYSICAL FORM:.....Liquid.
COLOR:.....Clear to pale yellow.
ODOR:.....Mild.
BOILING POINT:.....> 400°F.
MELTING POINT/FREEZE POINT:.....No data.
VISCOSITY:.....1,000 cPs.
pH:.....No data.
SOLUBILITY IN WATER:.....Slight.
SPECIFIC GRAVITY:.....1.15
BULK DENSITY:.....9.6 pounds/gallon.
VAPOR PRESSURE:.....< 1 mmHg @ 20°C.
VAPOR DENSITY:.....Heavier than air.
% VOLATILE BY WEIGHT:.....EPA Method 24, as described in 40 CFR Part 60, was used to determine the Volatile Matter Content of mixed epoxy resin and hardener. This method states that two-component coating systems should be tested by mixing the individual components together at the proper ratio. Refer to the hardener's MSDS for information about the total volatile content of the resin/hardener system.

10. REACTIVITY:

STABILITY:.....Stable.
HAZARDOUS POLYMERIZATION:.....Will not occur by itself, but a mass of more than one pound of product plus an aliphatic amine will cause irreversible polymerization with significant heat buildup.
INCOMPATIBILITIES:.....Strong acids, bases, amines and mercaptans can cause polymerization.
DECOMPOSITION PRODUCTS:.....Carbon monoxide and carbon dioxide fumes may be produced when heated to decomposition.

11. TOXICOLOGICAL INFORMATION:

No specific oral, inhalation or dermal toxicology data is known for this product. Specific toxicology information for a bisphenol-A based epoxy resin present in this product is indicated below:
Oral:.....LD50 >5000 mg/kg (rats)
Inhalation:.....No Data.
Dermal:.....LD50 = 20,000 mg/kg (skin absorption in rabbits)
TERATOLOGY:.....Diglycidyl ether bisphenol-A (DGEBPA) did not cause birth defects or other adverse effects on the fetus when pregnant rabbits were exposed by skin contact, the most likely route of exposure, or when pregnant rats or rabbits were exposed orally.
Ethylene glycol monobutyl ether (present at < 0.3 %) causes harm to the fetus in laboratory animal studies. Harm to the fetus occurs at exposure levels that harm the pregnant animal. The relevance of these findings to humans is uncertain.
REPRODUCTIVE EFFECTS:.....DGEBPA, in animal studies, has been shown not to interfere with reproduction.
MUTAGENICITY:..... DGEBPA in animal mutagenicity studies were negative. In vitro mutagenicity tests were negative in some cases and positive in others.
CARCINOGENICITY:
NTP.....Product not listed.

IARC.....Product not listed.
OSHA.....Product not listed.
Many studies have been conducted to assess the potential carcinogenicity of diglycidyl ether of bisphenol-A. Although some weak evidence of carcinogenicity has been reported in animals, when all of the data are considered, the weight of evidence does not show that DGEBPA is carcinogenic. Indeed, the most recent review of the available data by the International Agency for Research on Cancer (IARC) has concluded that DGEBPA is not classified as a carcinogen.
Epichlorohydrin, an impurity in this product (<5 ppm) has been reported to produce cancer in laboratory animals and to produce mutagenic changes in bacteria and cultured human cells. It has been established by the International Agency for Research on Cancer (IARC) as a probable human carcinogen (Group 2A) based on the following conclusions: human evidence – inadequate; animal evidence – sufficient. It has been classified as an anticipated human carcinogen by the National Toxicology Program (NTP).

12. ECOLOGICAL INFORMATION:

Prevent entry into sewers and natural waters. May cause localized fish kill.
Movement and Partitioning:
Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Kow between 3 and 5).
Degradation and Transformation:
Theoretical oxygen demand is calculated to be 2.35 p/p. 20-day biochemical oxygen demand is <2.5%.
Ecotoxicology:
Material is moderately toxic to aquatic organisms on an acute basis. LC50/EC50 between 1 and 10 mg/L in most sensitive species.

13. DISPOSAL CONSIDERATIONS:

WASTE DISPOSAL METHOD:.....Evaluation of this product using RCRA criteria shows that it is not a hazardous waste, either by listing or characteristics, in its purchased form. It is the responsibility of the user to determine proper disposal methods.
Incinerate, recycle (fuel blending) or reclaim may be preferred methods when conducted in accordance with federal, state and local regulations.

14. TRANSPORTATION INFORMATION:

D.O.T. SHIPPING NAME:.....Not regulated by DOT.
TECHNICAL SHIPPING NAME:.....Not applicable.
D.O.T. HAZARD CLASS:.....Not applicable.
U.N./N.A. NUMBER:.....Not applicable.
PACKING GROUP:.....Not applicable.

15. REGULATORY INFORMATION:

OSHA STATUS:.....Slight irritant; possible sensitizer.
TSCA STATUS:.....All components are listed on TSCA inventory.
SARA TITLE III:
SECTION 313 TOXIC CHEMICALS.....None (deminimus).
STATE REGULATORY INFORMATION:
The following chemicals are specifically listed or otherwise regulated by individual states. For details on your regulatory requirements you should contact the appropriate agency in your state.

COMPONENT NAME /CAS NUMBER	CONCENTRATION	STATE CODE
Epichlorohydrin		

106-89-8	< 5ppm	[1]CA
Phenyl glycidyl ether		
122-60-1	<5ppm	[1]CA
Ethylene Oxide		
75-21-8	<0.0019%	[1]CA
Ethylene glycol monobutyl ether		
111-76-2	< 0.3%	NJ, PA

[1] These substances are known to the state of California to cause cancer or reproductive harm, or both.

16. OTHER INFORMATION:

REASON FOR ISSUE:.....Additional information in Section 15.
PREPARED BY:.....T. J. Atkinson
APPROVED BY:.....G. M. House
TITLE:.....Health, Safety & Environmental Manager
APPROVAL DATE:.....October 13, 2005
SUPERSEDES DATE:.....January 3 , 2005
MSDS NUMBER:.....105-05b

Note: The Hazardous Material Indexing System (HMIS), cited in the Emergency Overview of Section 3, uses the following index to assess hazard rating: 0 = Minimal; 1 = Slight: 2 = Moderate; 3 = Serious; and 4 = Severe. This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of West System Inc. The data on this sheet is related only to the specific material designated herein. West System Inc. assumes no legal responsibility for use or reliance upon these data.

MATERIAL SAFETY DATA SHEET
West System Inc.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:.....WEST SYSTEM® 205™ Fast Hardener.
PRODUCT CODE:.....205
CHEMICAL FAMILY:.....Amine.
CHEMICAL NAME:.....Modified aliphatic polyamine.
FORMULA:.....Not applicable.

MANUFACTURER:
West System Inc.
102 Patterson Ave.
Bay City, MI 48706, U.S.A.
Phone: 866-937-8797 or 989-684-7286
www.westsystem.com

EMERGENCY TELEPHONE NUMBERS:
Transportation
CHEMTREC:.....800-424-9300 (U.S.)
703-527-3887 (International)
Non-transportation
Poison Hotline:.....800-222-1222

2. COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS

INGREDIENT NAME	CAS #	CONCENTRATION
Polyethylenepolyamine	29320-38-5	< 25%
Reaction products of TETA with Phenol/Formaldehyde	32610-77-8	< 25%
Triethylenetetramine (TETA)	112-24-3	< 15%
Hydroxybenzene	108-95-2	< 12%
Reaction Products of TETA and propylene oxide	26950-63-0	< 12%
Tetraethylenepentamine (TEPA)	112-57-2	< 12%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

HMIS Hazard Rating: Health - 3 Flammability - 1 Reactivity - 0

DANGER! Corrosive. Skin sensitizer. Moderate to severe skin, eye and respiratory tract irritant. May cause allergic reactions. Amber colored liquid with ammonia odor.

PRIMARY ROUTE(S) OF ENTRY:.....Skin contact, eye contact, inhalation.

POTENTIAL HEALTH EFFECTS:

ACUTE INHALATION:.....May cause respiratory tract irritation. Coughing and chest pain may result.

CHRONIC INHALATION:.....May cause respiratory tract irritation, coughing, sore throat, shortness of breath or chest pain.

ACUTE SKIN CONTACT:.....May cause strong irritation, redness. Possible mild corrosion.

CHRONIC SKIN CONTACT:.....Prolonged or repeated contact may cause an allergic reaction and possible sensitization in susceptible individuals. May be absorbed in harmful amounts.

EYE CONTACT:.....Moderate to severe irritation with possible tissue damage. Concentrated vapors can be absorbed in eye tissue and cause eye injury. Contact causes discomfort and possible corneal injury or conjunctivitis.

INGESTION:.....Single dose oral toxicity is moderate. May cause gastrointestinal tract irritation and pain.

SYMPTOMS OF OVEREXPOSURE:.....Respiratory tract irritation. Skin irritation and redness. Possible allergic reaction seen as hives and rash. Eye irritation. Possible liver and kidney disorders upon long term skin absorption overexposures.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Chronic respiratory disease, asthma. Eye disease. Skin disorders and allergies.

4. FIRST AID MEASURES:

FIRST AID FOR EYES:.....Immediately flush with water for at least 15 minutes. Get prompt medical attention.

FIRST AID FOR SKIN:.....Remove contaminated clothing. Immediately wash skin with soap and water. Do not apply greases or ointments. Get medical attention if severe exposure.

FIRST AID FOR INHALATION:.....Move to fresh air and consult physician if effects occur.
FIRST AID FOR INGESTION:.....Give conscious person at least 2 glasses of water. Do not induce vomiting. If vomiting should occur spontaneously, keep airway clear. Get medical attention.
5. FIRE FIGHTING MEASURES:
FLASH POINT:.....>270°F (PMCC)
EXTINGUISHING MEDIA:.....Water fog, alcohol foam, carbon dioxide (CO_2), dry chemical.
FIRE AND EXPLOSION HAZARDS:.....Burning will generate toxic fumes. When mixed with sawdust, wood chips, or other cellulosic material, spontaneous combustion can occur under certain conditions. If hardener is spilled into or mixed with sawdust, heat is generated as the air oxidizes the amine. If the heat is not dissipated quickly enough, it can ignite the sawdust.
SPECIAL FIRE FIGHTING PROCEDURES:.....Use full-body protective gear and a self-contained breathing apparatus. If spill has ignited, use water spray to disperse vapors and protect personnel attempting to stop leak. Use water to cool fire-exposed containers.
6. ACCIDENTAL RELEASE MEASURES:
SPILL OR LEAK PROCEDURES:.....Stop leak without additional risk. Wear proper personal protective equipment. Dike and contain spill. Ventilate area. Large spill - dike and pump into appropriate container for recovery. Small spill - dilute with water and recover or use inert, non-combustible absorbent material (*e.g.*, sand) and shovel into suitable container. Do not use sawdust, wood chips or other cellulosic materials to absorb the spill, as the possibility for spontaneous combustion exists. Wash spill residue with warm, soapy water if necessary.
7. HANDLING AND STORAGE:
STORAGE TEMPERATURE (min./max.):.....40°F (4°C) / 90°F (32°C).
STORAGE:.....Store in cool, dry place away from high temperatures and moisture. Keep container tightly closed.
HANDLING PRECAUTIONS:.....Use with adequate ventilation. Do not breath vapors or mists from heated material. Avoid exposure to concentrated vapors. Avoid skin contact. Wash thoroughly after handling. When mixed with epoxy resin this product causes an exothermic reaction, which in large masses, can produce enough heat to damage or ignite surrounding materials and emit fumes and vapors that vary widely in composition and toxicity.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION:
EYE PROTECTION GUIDELINES:.....Chemical splash-proof goggles or face shield.
SKIN PROTECTION GUIDELINES:.....Wear liquid-proof, chemical resistant gloves (nitrile-butyl rubber, neoprene, butyl rubber or natural rubber) and full body-covering clothing.
RESPIRATORY/VENTILATION GUIDELINES:
Use with adequate general and local exhaust ventilation to meet exposure limits. In poorly ventilated areas, use a NIOSH/MSHA approved respirator with an organic vapor cartridge.
ADDITIONAL PROTECTIVE MEASURES:
Use where there is immediate access to safety shower and emergency eye wash. Wash thoroughly after use. Contact lens should not be worn when working with this material.
OCCUPATIONAL EXPOSURE LIMITS:.....Not established for product as whole. Refer to OSHA's Permissible Exposure Level (PEL) or the ACGIH Guidelines for information on specific ingredients.
9. PHYSICAL AND CHEMICAL PROPERTIES:
PHYSICAL FORM.....Liquid.
COLOR.....Amber.
ODOR.....Ammonia-like.
BOILING POINT.....> 440°F.
MELTING POINT/FREEZE POINT.....Approximately 23°F.
pH.....Alkaline.
SOLUBILITY IN WATER.....Appreciable.
SPECIFIC GRAVITY.....1.05
BULK DENSITY.....8.85 pounds/gallon.
VAPOR PRESSURE.....< 1 mmHg @ 20°C.
VAPOR DENSITY.....Heavier than air.

VISCOSITY.....1,000 cPs
% VOLATILE BY WEIGHT.....EPA Method 24, as described in 40 CFR Part 60, was used to determine the Volatile Matter Content of mixed epoxy resin and hardener. This method states that two-component coating systems should be tested by determining weight loss after mixing the individual components together at the proper ratio, dissolving them in an appropriate solvent, and subjecting them to a temperature of 230°F. 105 Resin and 205 Hardener, mixed together at 5:1 by weight, has a density of 1181 g/L (9.86 lbs/gal). The combined VOC content for 105/205 is 63.4 g/L (0.53 lbs/gal).

10. REACTIVITY:
STABILITY:.....Stable.
HAZARDOUS POLYMERIZATION:.....Will not occur.
INCOMPATIBILITIES:.....Avoid excessive heat. Avoid acids, oxidizing materials, halogenated organic compounds (*e.g.*, methylene chloride). External heating or self-heating could result in rapid temperature increase and serious hazard. If such a reaction were to take place in a waste drum, the drum could expand and rupture violently.
DECOMPOSITION PRODUCTS:.....Very toxic fumes and gases when burned. Carbon monoxide, carbon dioxide and oxides of nitrogen; ammonia when heated.

11. TOXICOLOGICAL INFORMATION:
No specific oral, inhalation or dermal toxicology data is known for this product.
Oral:.....Expected to be moderately toxic.
Inhalation:.....Expected to be moderately toxic.
Dermal:.....Expected to be moderately toxic.
Adsorption of phenolic solutions through the skin may be very rapid and can cause death. Lesser exposures can cause damage to the kidney, liver, pancreas and spleen; and cause edema of the lungs. Chronic exposures can cause death from liver and kidney damage.
CARCINOGENICITY:
NTP.....No.
IARC.....No.
OSHA.....No.
This product contains no known carcinogens in concentrations of 0.1% or greater.

12. ECOLOGICAL INFORMATION:
Wastes from this product may present long term environmental hazards. Do not allow into sewers, on the ground or in any body of water.
Hydroxybenzene (phenol) (CAS # 108-95-2) biodegradability = 99.5% at 7 days.

13. DISPOSAL CONSIDERATIONS:
WASTE DISPOSAL METHOD:.....Evaluation of this product using RCRA criteria shows that it is not a hazardous waste, either by listing or characteristics, in its purchased form. It is the responsibility of the user to determine proper disposal methods.
Incinerate, recycle (fuel blending) or reclaim may be preferred methods when conducted in accordance with federal, state and local regulations.

14. TRANSPORTATION INFORMATION:
D.O.T. SHIPPING NAME:.....Polyamines, liquid, corrosive, n.o.s.
TECHNICAL SHIPPING NAME:.....(Triethylenetetramine)
D.O.T. HAZARD CLASS:.....Class 8
U.N./N.A. NUMBER:.....UN 2735
PACKING GROUP:.....PG III

15. REGULATORY INFORMATION:
OSHA STATUS:.....Corrosive; possible sensitizer.
TSCA STATUS:.....All components listed on TSCA Inventory.
SARA TITLE III:
SECTION 313 TOXIC CHEMICALS:.....This product contains hydroxybenzene (phenol) and is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.
STATE REGULATORY INFORMATION:
The following chemicals are specifically listed or otherwise regulated by individual states. For details on your regulatory requirements you should contact the appropriate agency in your state.

COMPONENT NAME
/CAS NUMBER CONCENTRATION STATE CODE
Tetraethylenepentamine
112-57-2 <12% FL, MA, NJ, PA
Tetraethylenetriamine
112-24-3 <15% FL, MA, NJ, PA

16. OTHER INFORMATION:

REASON FOR ISSUE:.....Update in Section 1.
PREPARED BY:.....T. J. Atkinson
APPROVED BY:.....G. M. House
TITLE:.....Health, Safety & Environmental Manager
APPROVAL DATE:.....January 3, 2005
SUPERSEDES DATE:.....January 5, 2004
MSDS NUMBER:.....205-05a

Note: The Hazardous Material Indexing System (HMIS), cited in the Emergency Overview of Section 3, uses the following index to assess hazard rating: 0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; and 4 = Severe.

This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of West System Inc. The data on this sheet is related only to the specific material designated herein. West System Inc. assumes no legal responsibility for use or reliance upon these data.

MATERIAL SAFETY DATA SHEET
West System Inc.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME:.....WEST SYSTEM® 403™ Microfibers.
PRODUCT CODE:.....403
CHEMICAL FAMILY:.....Cotton flock.
CHEMICAL NAME:.....Proprietary blend containing cotton flock.
FORMULA:.....No information.

MANUFACTURER: EMERGENCY TELEPHONE NUMBERS:

West System Inc.
102 Patterson Ave.
Bay City, MI 48706, U.S.A.
Phone: 866-937-8797 or 989-684-7286
www.westsystem.com

Transportation
CHEMTREC:.....800-424-9300 (U.S.)
703-527-3887 (International)
Non-transportation
Poison Hotline:.....800-222-1222

2. COMPOSITION/INFORMATION ON HAZARDOUS INGREDIENTS

INGREDIENT NAME CAS# CONCENTRATION

Silicon dioxide 7631-86-9 < 20%

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

HMIS Hazard Rating: Health - 1 Flammability - 1 Reactivity - 0

CAUTION! Nuisance dust. Avoid excessive inhalation of airborne dust. White powder, no odor.

PRIMARY ROUTE(S) OF ENTRY:.....Inhalation.

POTENTIAL HEALTH EFFECTS:

ACUTE INHALATION:.....If exposure limits are exceeded, the respiratory tract may become irritated. May cause shortness of breath, coughing, and/or chest tightness due to temporarily physically overloading the lungs.

CHRONIC INHALATION:.....Repeated excessive inhalation could cause drying of the mucous membranes of the respiratory tract.

ACUTE SKIN CONTACT:.....May cause temporary irritation and drying of the skin.

CHRONIC SKIN CONTACT:.....Prolonged contact may cause dermatitis due to drying of the skin.

EYE CONTACT:.....May cause irritation seen as redness and tearing.

INGESTION:.....No information.

SYMPTOMS OF OVEREXPOSURE:.....Irritation of the respiratory tract, sneezing, coughing. Dry, chapped skin. Redness and tearing of the eyes.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

Skin or respiratory conditions, such as asthma and dermatitis.

4. FIRST AID MEASURES:

FIRST AID FOR EYES:.....Flush adequately with water to remove particles. If discomfort persists, seek medical advice.

FIRST AID FOR SKIN:.....Wash with soap and water. Apply moisturizing cream to replenish moisture in the skin if necessary.

FIRST AID FOR INHALATION:.....Remove to fresh air if effects occur. If effects persists, seek medical advice.

FIRST AID FOR INGESTION:.....No specific information.

5. FIRE FIGHTING MEASURES:

FLASH POINT:.....No data.

EXTINGUISHING MEDIA:.....Water, dry powder or carbon dioxide (CO_2).

SPECIAL FIRE FIGHTING PROCEDURES:

When excessive flock dust becomes airborne, a moderate explosion hazard develops. Ignitable. Once ignited, builds pressure at a substantial rate.

6. ACCIDENTAL RELEASE MEASURES:

SPILL OR LEAK PROCEDURES:.....Sweep and shovel or use properly grounded vacuum

equipment. Do so in a manner that minimizes airborne dust.

7. HANDLING AND STORAGE:

STORAGE TEMPERATURE (min./max.):.....0°F (-17°C)/100°F (38°C)

STORAGE:.....Keep dry.

HANDLING PRECAUTIONS:.....Avoid generating excessive airborne material when handling. Properly ground all material handling equipment to prevent static discharge.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION:

EYE PROTECTION GUIDELINES:.....Safety glasses or goggles are recommended, depending on the expected level of exposure.

SKIN PROTECTION GUIDELINES:.....Areas expected to have repeated exposure, such as hands, may need to be protected by an impervious material to prevent dryness. Barrier creams can be used effectively.

RESPIRATORY/VENTILATION GUIDELINES:

Work environments should be maintained below applicable exposure level through the use of engineering controls, such as dilution and exhaust ventilation. If this is not feasible, use a NIOSH approved dust mask/respirator for nuisance dust.

ADDITIONAL PROTECTIVE MEASURES:

Practice good industrial hygiene by washing with soap and water after each use. Apply moisturizing cream to replenish moisture to skin if necessary.

OCCUPATIONAL EXPOSURE LIMITS:.....This product should be treated as a nuisance dust. Refer to OSHA's Permissible Exposure Level (PEL) or the ACGIH Guidelines for information on specific ingredients.

9. PHYSICAL AND CHEMICAL PROPERTIES:

PHYSICAL FORM.....Powder.

COLOR.....Off-white.

ODOR.....Odorless.

BOILING POINT.....No data.

MELTING POINT/FREEZE POINT.....No data.

pH.....No data.

SOLUBILITY IN WATER.....Insoluble.

SPECIFIC GRAVITY.....1.54

BULK DENSITY.....0.93 pounds/gallon.

VAPOR PRESSURE.....Not applicable.

VAPOR DENSITY.....Not applicable.

% VOLATILE BY WEIGHT.....Zero.

10. REACTIVITY:

STABILITY:.....Stable.

HAZARDOUS POLYMERIZATION:.....Will not occur.

INCOMPATIBILITIES:.....None known. This product is inert.

DECOMPOSITION PRODUCTS:.....Can include carbon monoxide (CO) and carbon dioxide (CO2).

11. TOXICOLOGICAL INFORMATION:

No toxic effects are expected from this product.

CARCINOGENICITY:

NTP.....No.

IARC.....No.

OSHA.....No.

12. ECOLOGICAL INFORMATION:

No specific information.

13. DISPOSAL CONSIDERATIONS:

WASTE DISPOSAL METHOD: This material is determined not to be a hazardous waste as per RCRA standards, either by listing or characteristics. Disposer must comply with all federal, state and local laws. Landfill is the preferred disposal method.

14. TRANSPORTATION INFORMATION:

D.O.T. SHIPPING NAME:.....Not regulated by DOT.

TECHNICAL SHIPPING NAME:.....Not applicable.
D.O.T. HAZARD CLASS:.....Not applicable
U.N./N.A. NUMBER:.....Not applicable
PACKING GROUP:.....Not applicable
15. REGULATORY INFORMATION:
OSHA STATUS:.....Hazardous. Nuisance dust.
TSCA STATUS:.....All components of this product are in compliance with TSCA Inventory requirements.
SARA TITLE III:
SECTION 313 TOXIC CHEMICALS.....None.
STATE REGULATORY INFORMATION:
The following chemicals are specifically listed or otherwise regulated by individual states. For details on your regulatory requirements you should contact the appropriate agency in your state.
COMPONENT NAME
/CAS NUMBER CONCENTRATION STATE CODE
None known.
16. OTHER INFORMATION:
REASON FOR ISSUE:.....Update in Section 1.
PREPARED BY:.....T. J. Atkinson
APPROVED BY:.....G. M. House
TITLE:.....Health, Safety & Environmental Manager
APPROVAL DATE:.....January 3, 2005
SUPERSEDES DATE:.....January 5, 2004
MSDS NUMBER:.....403-05a
Note: The Hazardous Material Indexing System (HMIS), cited in the Emergency Overview of Section 3, uses the following index to assess hazard rating: 0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; and 4 = Severe.
This information is furnished without warranty, expressed or implied, except that it is accurate to the best knowledge of West System Inc. The data on this sheet is related only to the specific material designated herein. West System Inc. assumes no legal responsibility for use or reliance upon these data.

MATERIAL SAFETY DATA SHEET

I - PRODUCT INFORMATION

PRODUCT: R-Control® Do-All-Ply®

SYNONYMS: Adhesive/Sealant

HAZARD RATING:			
0=Minimal	2=Moderate	HEALTH	1
1=Slight	3=Serious	FIRE	3
	4=Severe	REACTIVITY	0

CONTACT:
AFM/R-Control Building Systems
211 River Ridge Circle #102
Burnsville, MN 55337
(952) 474-0809

EMERGENCY CONTACT:
CHEMTREC
1-800-424-9300
(703) 527-3887

II - INGREDIENT AND HAZARD INFORMATION

HAZARDOUS INGREDIENT NAME:	CAS NO:	Percent	TSCA
Light Hydrotreated Naphtha	64742-49-0	15-25%	Y

Ingredient Notes:
Remaining ingredients are not considered OSHA hazardous.

III - PHYSICAL AND CHEMICAL PROPERTIES

FORM: Non-sag mastic
COLOR: Light Gray
SOLUBILITY IN WATER: insol.
pH VALUE, +/-.3: N/A
BOILING RANGE: 130° F - 160° F (54.44° C - 71.11° C)
VAPOR PRESSURE (mmHg): over 99 @ 68° F (20 ° C)

EVAPORATION RATE: 4.4 times Faster than n-Butyl Acetate
VAPOR DENSITY (Air = 1): Heavier than air
% VOLATILE, VOLUME: 36%
% VOLATILE, WEIGHT: approx. 20%
SPECIFIC GRAVITY: 1.19954
VOC (less H2O or exempt): 260 g/L (19%)

NOTE: *BOIL RANGE, EVAP RATE, VAPOR DENSITY AND PRESSURE FOR SOLVENT ONLY!

IV - FIRE FIGHTING MEASURES (Flash, UEL, LEL for solvent only)

Flammability Class: IB
Flash Range: approx.
0° F - 18° F (-17.78° C - - 7.78° C)
Tag Closed Cup
Explosive Range (LEL./UEL): 1 %
6.7%
EXTINGUISHING MEDIA: Carbon Dioxide---Dry Chemical---Foam
Use water fog to cool material in vicinity of fire.

SPECIAL FIRE FIGHTING PROCEDURES: Use self-contained breathing apparatus/respirator with full facepiece operated in pressure demand with full protective equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Any closed container may rupture when exposed to extreme heat. Solvent vapors are heavier than air and travel along the ground. Vapors given off are flammable and may be ignited in air explosively.

V - HEALTH HAZARDS & FIRST AID

ROUTES OF ENTRY: Inhalation - Yes | Skin - Yes | Ingestion - Yes

Contains N-Hexane (110-54-3) in trace quantities, which can cause peripheral neuropathy & nervous system damage.

CARCINOGENICITY:
NTP - N/E | IARC Monographs - N/E | OSHA - No

EFFECTS OF OVEREXPOSURE
EYES: May cause eye irritation, redness, tearing and blurring.

SKIN: Prolonged or repeated exposure to this material may cause moderate irritation, defatting, and dermatitis.

INHALATION: May cause nose or throat irritation. High concentrations may cause acute central nervous system depression, e.g. headaches, dizziness, nausea and confusion.

INGESTION: Can cause gastrointestinal irritation, nausea, vomiting and diarrhea.

V - HEALTH HAZARDS & FIRST AID

FIRST AID

EYES: Flush eyes gently with water for at least 15 minutes lifting eyelids occasionally; get prompt medical attention.

SKIN: Wash exposed areas with mild soap and water. Apply mild skin cream. Remove contaminated clothing.

INHALATION: Move affected person to gresh air; if breathing is difficult, administer oxygen; if breath has stopped, give artificial respiration. Get medical attention.

INGESTION: DO NOT INDUCE VOMITING! Get immediate medical attention.

CHRONIC HAZARDS: NOTICE - Reports have associated repeated and prolonged occupational overexposure to solvents with permanent brain, nervous system, liver or kidney damage or may cause cardiac arrhythmia. INTENTIONAL misuse of this product by deliberately inhaling its vapors may be harmful or fatal.

N/E = NOT ESTABLISHED

VI - STABILITY AND REACTIVITY

STABILITY : Stable.

HAZARDOUS POLYMERIZATION: Will not occur.

INCOMPATIBILITY: Keep away from strong oxidizing agents.

CONDITIONS TO AVOID: Keep away from heat, spark, open flames and any ignition source.

HAZARDOUS DECOMPOSITION: Will produce fumes and smoke containing carbon monoxide and dioxide under fire conditions.

VII - ACCIDENTAL RELEASE AND DISPOSAL MEASURES

STEPS TO BE TAKEN IN CASE OF SPILL: Eliminate all ignition sources. Ventilate confined areas. (Open windows and doors). Wear appropriate protective clothing. Cover with absorbent. Scoop into sealable safety container.

WASTE DISPOSAL METHOD: Dispose of product in accordance with local, county, state and federal regulations.

VIII - EXPOSURE CONTROLS/ PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS:

	ACGIG TLV	ACGIH TLV-C	ACGIH STEL	OSHA STEL	OSHA PEL
Light Hydrotreated Naphtha	400.00 PPM	N/E	N/E	N/E	400.00 PPM

RESPIRATORY PROTECTION: If TLV of the product is exceeded, a NOISH/MSHA jointly approved air supply respirator is advised in the absence of proper ventilation. OSHA regulations also permit the use of other types of NIOSH/MSHA respirators under specified conditions. (See your safety equipment supplier for more information.)

VENTILATION: Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLV. Ventilate during application and curing of this product.

PROTECTIVE CLOTHING: Rubber gloves should be worn where skin contact is likely. Wear impervious clothing and shoes.

EYE PROTECTION: Chemical goggles/safety glasses should be worn.

HANDLING AND STORAGE PRECAUTIONS: Keep away from heat, spark and flame. Keep out of reach of children. Keep container closed while not in use. Do not cut or burn receptacles that have contained a solvent based product. Do not reuse this container. Use only in a well ventilated area.

N/E = NOT ESTABLISHED

IX - TRANSPORT INFORMATION

DOT CLASSIFICATIONS FOR 1 GALLON AND UNDER CONTAINERS:

DESCRIPTION: ORM-D Consumer commodity
CLASS/UN NO.: None
DOT LABEL: ORM-D
IMDG Class: 3.3
IMDG BOL: Adhesive, 3, UN1133, PG III, LTD QTY

DOT CLASSIFICATIONS FOR OVER 1 GALLON SIZE CONTAINERS:

DESCRIPTION: Adhesive
CLASS/UN NO.: Class 3, Packing group III
DOT LABEL: Flammable Adhesive, UN 1133
IMDG Class: 3.3
IMDG BOL: Adhesive, 3, UN1133, PG III

X - REGULATORY INFORMATION

This material fits the EPA Hazard Category definition of Immediate (Acute) and Delayed (Chronic) Health Hazards and Fire Hazard under SARA Sections 311, 312.

Chemical ingredients are listed on the TSCA inventory.
California PROP.65 Chemicals: none known

SARA Section 313 toxic chemicals: NONE above the de minimis reporting thresholds.

DISCLAIMER: The information contained herein is based on data available as of the date of preparation of this MSDS and which we believe to be reliable. However, no warranty is expressed or implied regarding the accuracy of the data. We shall not be responsible for the use of this information, or of any products, method, apparatus mentioned, and use must make his own investigation to determine the suitability of the information of products for his particular purpose, for the protection of the environment, and the health & safety of the users of this material.

Copyright by: AFM R-Control
211 River Ridge Circle #102
Burnsville, MN 55337
(952)474-0809

AFM®, R-Control® and Do-All-Ply are trademarks of AFM Corporation.

Firestone Building Products Company
Material Safety Data Sheet

August 8, 2006

SECTION 1: PRODUCT IDENTIFICATION

Product Name:	UltraPly TPO General Purpose Sealant
Chemical Name / Synonym:	EPDM Adhesive
Chemical Family:	Mixture
24-Hour Emergency Phone:	(800) 424-9300 CHEMTREC
Manufacturer's Name:	Firestone Building Products Company
Manufacturer's Address:	310 East 96th Street, Indianapolis, IN 46240
NFPA Hazard Rating:	Health 2, Flammability 3, Reactivity 0
HMIS Hazard Rating:	Health 1, Flammability 3, Reactivity 0

SECTION 2: CHEMICAL COMPOSITION

Chemical Name:	Common Name:	CAS #:	% (by wt)	Exposure Limits:
Aliphatic Petroleum Distillates	Naphtha	64742-89-8	<20	PEL 500 ppm TLV 300 ppm (based on TLV for VM&P Naphtha)
Silica, Crystalline, Quartz	Rose Quartz, Sand	14808-60-7	<1 PEL	(Respirable) 10 mg/m3 (% Si02 + 2) PEL (Total) 30 mg/m3 (% Si02 + 2) TLV (Respirable) 0.025 mg/m3
Nonhazardous as per 29 CFR 1910.1200.	None	-	>80	None Established

SECTION 3: HAZARD IDENTIFICATION

Primary Route of Exposure: Inhalation, skin

Signs and Symptoms of Exposure: Eye contact may cause moderate eye irritation, redness, tearing and blurred vision. Prolonged or repeated skin contact may cause irritation, dermatitis and drying of the skin. Inhalation may cause respiratory system irritation and central nervous system depression (narcosis) characterized by headache, dizziness, muscular weakness and fatigue. May cause unconsciousness if exposure is excessive. Aliphatic Petroleum Distillate LC50: 3,400 ppm/4hr, rat; Aliphatic Petroleum Distillate LD50: >8 g/kg, rat.

Medical Conditions Aggravated by Exposure: Pre-existing lung, skin, eye or nervous system disorders may be aggravated by exposure to this material. Chronic Effects: May cause kidney and liver damage. May cause brain cell and neuromuscular damage based upon animal studies. Prolonged and repeated exposure to crystalline silica containing dust can result in injury to the lungs. This condition is known as silicosis. Silicosis is characterized by shortness of breath, decreased expansion of the chest, dry cough, leading to fatigue, dyspnea, and cyanosis, loss of appetite, pleuritic pain and decreased work capacity.

Carcinogenicity: This material contains a small amount of crystalline silica. Some researchers have reported evidence that it may be carcinogenic in humans following prolonged and repeated inhalation.
NTP Known To Be A Human Carcinogen
IARC Class 1
NIOSH Carcinogen

SECTION 4: FIRST AID MEASURES

First Aid Procedures: If this material contacts the eyes, hold eyelids open and flush immediately with a gentle stream of water for at least 15 minutes, preferably at an eyewash fountain. Get medical attention. In case of skin contact, clean with rubbing alcohol first, followed immediately by washing affected area with soap and water. In case of inhalation, remove to fresh uncontaminated air. Administer oxygen if breathing is labored. Give artificial respiration if breathing has stopped. Get medical attention immediately if oxygen or artificial respiration is administered. In case of accidental ingestion, do not induce vomiting. Get medical attention and advise the physician of the nature of the material.

SECTION 5: FIRE FIGHTING PROCEDURES

Suitable Extinguishing Media: Carbon dioxide, dry chemical, or foam. Do not use a direct stream of water. Product will float and can be reignited on the surface of the water.

Hazardous Combustion Products: Carbon dioxide, carbon monoxide, oxides of nitrogen, aldehydes, various hydrocarbons, phenols, acrid smoke and irritating fumes.

Recommended Fire Fighting Procedures: Wear impermeable protective clothing and self-contained breathing apparatus. Toxic fumes and vapors may be evolved.

Unusual Fire and Explosion Hazards: Heat builds up pressure in closed containers. Cool with water stream.

SECTION 6: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to Be Taken in Case Material is Released or Spilled: Remove ignition sources. Absorb on inert material. Use non- sparking tools. Place in secure containers for disposal.

Precautions to Be Taken in Handling and Storing: Keep away from heat, sparks, and open flames. Keep containers closed. Vapors of this material are heavier than air and will collect in low or confined areas. Containers, even those that have been emptied, can contain explosive vapors. Do not cut, drill, grind, weld or perform similar operations near containers. Static electricity may accumulate and create a fire hazard. Ground fixed equipment. Bond and ground all transfer containers and equipment.

SECTION 7: EXPOSURE CONTROLS / PERSONAL PROTECTION

Ventilation: Use in a well-ventilated location.

Respiratory Protection: If personal exposure concentrations cannot be maintained below the appropriate exposure limits using engineering controls, a NIOSH approved respirator may be appropriate based on employer-determined exposure levels.

Eye Protection: The use of safety glasses with side shields or chemical splash goggles when using this product may be warranted.

Skin Protection: The use of nitrile or polyvinyl alcohol gloves for direct handling may be warranted.

Other: Not required.

Work / Hygienic Practices: Wash exposed skin prior to eating, drinking and smoking and at the end of each work shift. Wash contaminated clothing prior to reuse.

SECTION 8: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: White paste with characteristic aliphatic solvent odor.

Flash Point:	52°F	Lower Explosive Limit:	0.5%
Method Used:	TCC	Upper Explosive Limit:	6.0%
Evaporation Rate:	9.2 (Ethyl Ether=1)	Boiling Point:	268°F
pH (undiluted product):	Unknown	Melting Point:	Not Applicable
Solubility in Water:	<0.5%	Specific Gravity:	1.43 (Water=1)

Vapor Density:	2 (Air=1)	Percent Volatile:	20% Maximum
Vapor Pressure:	45 mm Hg @ 78°F		

SECTION 9: STABILITY AND REACTIVITY

Thermal Stability:	Stable
Hazardous Polymerization:	Will not occur
Conditions to Avoid:	Avoid flames, sparks or other sources of ignition.

SECTION 10: TRANSPORTATION

Regulatory Agency:	U.S.A., DOT
Proper Shipping Name:	Adhesives
Hazard Classification:	3
Identification Number:	UN1133
Packing Group:	II
Labels Required:	Flammable Liquid
Other Requirements:	None known

SECTION 11: MISCELLANEOUS INFORMATION

Additional Comments:	Exposure to respirable crystalline quartz is not likely with this product under normal conditions.
Date of Previous MSDS:	December 9, 2005

Changes Since Previous MSDS: TLV for crystalline silica in section 2; carcinogenicity information in section 3.

Telephone Number for
Additional Information:
(317) 575-7190

DISCLAIMER

The information contained herein is based on data considered accurate which has been obtained from other companies and organizations. However, no warranty or representation is expressed or implied that the information, is accurate, complete or representative. Firestone Building Products Company, a subsidiary of Bridgestone Americas Holding, Inc. assumes no responsibility for injury to the buyer, the buyer's employees, or any third persons, if reasonable safety procedures are not followed. Additionally, Firestone Building Products Company assumes no responsibility for injury to buyer, the buyer's employees, or any third persons caused by abnormal use of this material, even if reasonable safety procedures are followed.

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

MSDS # 61-924-001
Page 1 of 8

United States Gypsum Company
125 South Franklin Street
Chicago, Illinois 60680-4124
A Subsidiary of USG Corporation

Product Safety: 1 (800) 507-8899
www.usg.com
Version Date: October 8, 2003
Version: 2

SECTION 1
CHEMICAL PRODUCT AND IDENTIFICATION

PRODUCT: USG FIRECODE® Brand Acrylic Firestop Sealant
CHEMICAL FAMILY: Acrylic Sealant

SECTION 2
COMPOSITION, INFORMATION ON INGREDIENTS

MATERIAL	WT%	TLV (mg/m³)	PEL(mg/m³)	CAS NUMBER
Acrylic Polymer	40-50	(NE)	(NE)	Proprietary
Water	35-40	(NE)	(NE)	7732-18-5
White mineral oil	5-10	5 (mist)	5 (mist)	8042-47-5
Silica, amorphous, fumed	1-5	10	15	112945-52-5
Titanium Dioxide	1-5	10	15	13463-67-7
Propylene Glycol	1-5	(NE)	(NE)	Proprietary
Iron Oxide	1-5	5	10	1309-37-1
Phthalo blue	0.1-0.2	(NE)	(NE)	Proprietary
Chlorothalonil	0.1-0.3	(NE)	(NE)	1897-45-6

(T) – Total (R) – Respirable (NE) – Not Established mmpfc - million particles per cubic foot of air
All ingredients of this product are included in the U.S. Environmental Protection Agency's Toxic Substances Control Act Chemical Substance Inventory. All components of this product are included in the Canadian Domestic Substances List (DSL).

SECTION 3
HAZARD IDENTIFICATION

INFORMATION FOR HANDLING AND IDENTIFICATION OF CHEMICAL HAZARDS

NFPA Ratings:
Health: 1
Fire: 0
Reactivity: 0

HIMS Ratings:
Health: *1
Fire: 0
Reactivity: 0

0 = Minimal Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

Personal Protection: Use eye and skin protection. Use NIOSH/MSHA-approved respiratory protection when necessary.

B- Safety glasses, gloves

EMERGENCY OVERVIEW: This product is not expected to produce any unusual hazards during normal use. Exposure to high vapor levels may irritate the skin, eyes, nose, throat, or upper respiratory tract.

SECTION 3 HAZARD IDENTIFICATION (continued)

POTENTIAL HEALTH EFFECTS

ACUTE:

Eyes: Airborne dust created when sanding a surface coated with this product or direct contact can cause mechanical irritation of eyes. If burning, redness, itching, pain or other symptoms persist or develop, consult physician.

Skin: Direct, prolonged or repeated contact with the skin may cause irritation.

Inhalation: Inhalation of vapors may cause headache and nausea. Inhalation of dust created when sanding a surface coated with this product can irritate the nose, throat, and the upper respiratory tract. Persons subjected to large amounts of this dust will be forced to leave area because of nuisance conditions such as coughing, sneezing and nasal irritation. Labored breathing may occur after excessive inhalation. If respiratory symptoms persist, consult physician.

Ingestion: If ingested may cause gastrointestinal discomfort including nausea, vomiting, lethargy, and diarrhea and may be fatal.

CHRONIC:

Eyes: None known.

Skin: None known.

Ingestion: No known effects.

Inhalation: Exposures to respirable crystalline silica are not expected unless product is ground, sanded or otherwise mechanically broken down a respirable size fraction. Exposure is not expected during the normal use of this product. Prolonged and repeated exposure to airborne free respirable crystalline silica can result in lung disease (i.e., silicosis) and/or lung cancer.

Repeated and prolonged exposure to iron oxide dust may cause a benign pneumoconiosis called siderosis. The ACGIH recommended limit is set to protect against siderosis, any exposure is expected to remain well below OSHA regulatory and ACGIH recommended limits during normal handling and use of this product.

TARGET ORGANS: Eyes, skin and respiratory system.

PRIMARY ROUTES OF ENTRY: Inhalation, eyes and skin contact.

SECTION 4
FIRST AID MEASURES

FIRST AID PROCEDURES

Eyes: In case of contact, do not rub or scratch your eyes. Flush thoroughly with water for 15 minutes to remove particles. Get medical attention immediately.

Skin: Wash with mild soap and water. A commercially available hand lotion may be used to treat dry skin areas. If skin has become cracked, take appropriate action to prevent infection and promote healing. If irritation persists, consult physician.

Inhalation: Remove to fresh air. Leave the area of dust exposure and remain away until coughing and other symptoms subside. Other measures are usually not necessary, however if conditions warrant, contact physician.

Ingestion: Get medical attention immediately.

MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED: Pre-existing upper respiratory and lung diseases such as, but not limited to, bronchitis, emphysema and asthma. Pre-existing skin diseases such as, but not limited to, rashes and dermatitis.

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 5
FIRE FIGHTING MEASURES

General Fire Hazards:	Not expected to burn.
Extinguishing Media:	Water or use extinguishing media appropriate for surrounding fire.
Special Fire Fighting Procedures:	Wear appropriate personal protective equipment (See section 8).
Unusual Fire & Explosion Hazards:	None known
Hazardous Combustion Products:	None known

Flash Point:	None Known	**Auto Ignition:**	Not Applicable
Method Used:	Not Applicable	**Flammability Classification:**	Not Applicable
Upper Flammable Limit (UFL):	Not Applicable		
Lower Flammable Limit (LFL):	Not Applicable	**Rate of Burning:**	Not Applicable

SECTION 6
ACCIDENTAL RELEASE MEASURES

CONTAINMENT:
No special precautions. Wear appropriate personal protection (See Section 8).

CLEAN-UP:
Use normal clean up procedures. Wear appropriate protective equipment. Ventilate area. Floor may be slippery; use care to avoid falling. Shovel or scoop up material from spillage into a waste container for disposal.

DISPOSAL:
Follow all local, state, provincial and federal regulations. Never discharge large releases directly into sewers or surface waters.

SECTION 7
HANDLING AND STORAGE

HANDLING:
Avoid breathing vapors and eye and skin contact.
Use good safety and industrial hygiene practices.

STORAGE:
Store at room temperature in a dry location.

SECTION 8
EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:
Use ventilation to keep vapor concentrations below permissible exposure limits (See Section 2).
Where general ventilation is inadequate, use process enclosures, local exhaust ventilation, or other engineering controls to control vapor levels below permissible exposure limits (see Section 2). If engineering controls are not possible, wear a properly fitted NIOSH/MSHA-approved vapor respirator.

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION (continued)

RESPIRATORY PROTECTION:
Wear a NIOSH/MSHA-approved respirator in poorly ventilated areas, and if TLV is exceeded. A respiratory program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

OTHER PERSONAL PROTECTIVE EQUIPMENT:
Eye/Face: Wear safety glasses, goggles or face shield for eye protection.
Skin: Wear neoprene gloves for hand protection. Wear adequate clothing to minimize skin contact. Wash clothing on a regular basis.

General: Selection of Personal Protective Equipment will depend on environmental working conditions and operations.

SECTION 9
PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Red	**Odor**	Mild acrylic odor
Physical State	Paste	**pH**	7-10
Vapor Pressure	Not Applicable	**Vapor Density**	Not Available
Boiling Point	212 °F	**Freezing Point**	32 °F
Melting Point	Not Applicable	**Solubility (H2O)**	Miscible
Specific Gravity	1.06	**Particle Size**	Not Applicable
Softening Point	Not Applicable	**Evaporation Rate**	Not Applicable
Viscosity	Not Applicable	**Bulk Density**	Not Available
Percent Volatile	40	**Molecular Weight**	Mixture
VOC Content	< 47 g/L less water & exempt solvent		

SECTION 10
CHEMICAL STABILITY AND REACTIVITY

STABILITY:	Stable.
CONDITIONS TO AVOID:	Contact with incompatibles.
INCOMPATIBILITY:	Strong oxidizing agents, acids and bases.
HAZARDOUS POLYMERIZATION:	Will not occur.
HAZARDOUS DECOMPOSITION:	None known.

SECTION 11
TOXICOLOGICAL INFORMATION

ACUTE EFFECTS:
Direct contact may cause eye or skin irritation. Exposure to vapors may cause eye, skin and/or respiratory irritation. (See Section 3)
LD_{50}: Not Available for product.
LC_{50}: Not Available for product.

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 11 TOXICOLOGICAL INFORMATION (continued)

CHRONIC EFFECTS / CARCINOGENICITY:

Crystalline silica: Exposures to respirable crystalline silica are not expected unless product is ground or otherwise mechanically broken down a respirable size fraction. Exposure is not expected during the normal use of this product. Prolonged and repeated exposure to airborne free respirable crystalline silica can result in lung disease (i.e., silicosis) and/or lung cancer.

Iron Oxide Dust: Repeated and prolonged exposure to iron oxide dust may cause a benign pneumoconiosis called siderosis. The ACGIH recommended limit is set to protect against siderosis, any exposure is expected to remain well below OSHA regulatory and ACGIH recommended limits during normal handling and use of this product.

SECTION 12
ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: Not determined

Ecotoxicity value: Not determined.

SECTION 13
DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:

Dispose of material in accordance with Federal, State, Provincial, and Local regulations. Consult with environmental regulatory agencies for guidance on acceptable disposal practices. Never discharge directly into sewers or surface waters.

SECTION 14
TRANSPORT INFORMATION

U.S. DOT INFORMATION: Not a hazardous material per DOT shipping requirements. Not classified or regulated.

Shipping Name	Same as product name.
Hazard Class:	Not classified
UN/NA #:	None. Not classified.
Packing Group:	None.
Label (s) Required:	Not applicable.
GGVSec/MDG-Code:	Not classified.
ICAO/IATA-DGR:	Not applicable.
RID/ADR:	None
ADNR:	None

SECTION 15
REGULATORY INFORMATION

UNITED STATES REGULATIONS

All ingredients of this product are included in the U.S. Environmental Protection Agency's Toxic Substances Control Act Chemical Substance Inventory.

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 15 REGULATORY INFORMATION (continued)

UNITED STATES REGULATIONS (continued)

MATERIAL	WT%	302	304	313	CERCLA	CAA Sec. 112	RCRA Code
Acrylic Polymer	40-50	NL	NL	NL	NL	NL	NL
Water	35-40	NL	NL	NL	NL	NL	NL
White mineral oil	5-10	NL	NL	NL	NL	NL	NL
Silica, amorphous, fumed	1-5	NL	NL	NL	NL	NL	NL
Titanium Dioxide	1-5	NL	NL	NL	NL	NL	NL
Propylene Glycol	1-5	NL	NL	NL	NL	NL	NL
Iron Oxide	1-5	NL	NL	NL	NL	NL	NL
Phthalo blue	0.1-0.2	NL	NL	NL	NL	NL	NL
Chlorothalonil	0.1-0.3	NL	NL	NL	NL	NL	NL

Key : NL = Not Listed
SARA Title III Section 302 (EPCRA) Extremely Hazardous Substances: Threshold Planning Quantity (TPQ)
SARA Title III Section 304 (EPCRA) Extremely Hazardous Substances: Reportable Quantity (RQ)
SARA Title III Section 313 (EPCRA) Toxic Chemicals: X= Subject to reporting under section 313
CERCLA Hazardous Substances: Reportable Quantity (RQ)
CAA Section 112 (r) Regulated Chemicals for Accidental Release Prevention: Threshold Quantities(TQ)
RCRA Hazardous Waste: RCRA hazardous waste code

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations. All components of this product are included in the Canadian Domestic Substances List (DSL).

MATERIAL	WT%	IDL Item #	WHMIS Classification:
Acrylic Polymer	40-50	Not Listed	Not Listed
Water	35-40	Not Listed	Not Listed
White mineral oil	5-10	1224	Not Listed
Silica, amorphous, fumed	1-5	Not Listed	Not Listed
Titanium Dioxide	1-5	Not Listed	Not Listed
Propylene Glycol	1-5	Not Listed	Not Listed
Iron Oxide	1-5	762	Not Listed
Phthalo blue	0.1-0.2	Not Listed	Not Listed
Chlorothalonil	0.1-0.3	Not Listed	Not Listed

IDL Item # : Canadian Hazardous Products Act – Ingredient Disclosure List Item #
WHMIS Classification: Workplace Hazardous Material Information System

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 15 REGULATORY INFORMATION (continued)

CARCINOGENICITY CLASSIFICATION OF INGREDIENT(S) Respirable crystalline silica and chlorothalonil are associated with the nature of the raw materials used in the manufacture of this product and are not independent components of the product formulation. All substances, if present, are at levels well below regulatory limits. See Section 11 : Toxicology Information for detailed information.

MATERIAL	IARC	NTP	ACGIH	CAL- 65
Respirable Crystalline Silica	1	1	A2	Listed
White Mineral Oil	1	1	Not Listed	Listed
Chlorothalonil	2B	Not Listed	Not Listed	Listed

IARC – International Agency for Research on Cancer (World Health Organization)
1- Carcinogenic to humans
2A – Probably carcinogenic to humans
2B – Possibly carcinogenic to humans
3 - Not classifiable as a carcinogen
4 – Probably not a carcinogen

NTP – National Toxicology Program (Health and Human Services Dept., Public Health Service, NIH/NIEHS)
1- Known to be carcinogen
2- Anticipated to be carcinogens

ACGIH – American Conference of Governmental Industrial Hygienists
A1 – Confirmed human carcinogen
A2 – Suspected human carcinogen
A3 – Animal carcinogen
A4 - Not classifiable as a carcinogen
A5 – Not suspected as a human carcinogen

CAL-65 – California Proposition 65 "Chemicals known to the State of California to Cause Cancer"

SECTION 16
OTHER INFORMATION

Label Information
ΔWARNING!
Avoid exposure to fumes. Inhalation of vapor may cause headache, nausea, or irritation of nose, throat, and lungs. Use in a well ventilated area. Wear a NIOSH/MSHA-approved respirator in poorly ventilated areas. Avoid contact with eyes and skin. Wear safety glasses or goggles for eye protection. If eye contact occurs, immediately flush thoroughly with water for 15 minutes. If irritation persists, consult physician. Prolonged or repeated contact with skin can cause irritation. Wear waterproof gloves and protective work clothing for skin protection. If skin contact occurs, wash thoroughly with soap and water. If irritation persists, consult physician. Do not ingest. If ingested, consult physician immediately.
Product safety information: (800) 507-8899 or www.usg.com
KEEP OUT OF REACH OF CHILDREN.

Key/Legend

TLV	Threshold Limit Value
PEL	Permissible Exposure Limit
CAS	Chemical Abstracts Service (Registry Number)

MATERIAL SAFETY DATA SHEET
USG FIRECODE® Brand Acrylic Firestop Sealant

SECTION 16 OTHER INFORMATION (continued)

NIOSH	National Institute for Occupational Safety and Health
MSHA	Mine Safety and Health Administration
OSHA	Occupational Health and Safety Administration
ACGIH	American Conference of Governmental Industrial Hygienists
IARC	International Agency for Research on Cancer
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
NFPA	National Fire Protection Association
HMIS	Hazardous Materials Identification System
PPE	Personal Protection Equipment
TSCA	Toxic Substances Control Act
DSL	Canadian Domestic Substances List
NDSL	Canadian Non-Domestic Substances List
SARA	Superfund Amendments and Reauthorization Act of 1986
RCRA	Resource Conservation and Recovery Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
UN/NA#	United Nations/North America number
CFR	Code of Federal Regulations
WHMIS	Workplace Hazardous Material Information System

Prepared by:
Product Safety
USG Corporation
125 South Franklin St.
Chicago, Illinois 60606

END

Division 08: Doors & Windows

Section 08 16 13 – Fiberglass Doors
Section 08 54 13 – Fiberglass Windows
Section 08 60 00 – Roof Windows & Skylights
Section 08 71 00 - Door Hardware
Section 08 80 00 – Glazing
Section 08 84 13 - Decorative Plastic Glazing
Section 08 88 00 – Special Function Glazing

SECTION 08 16 13 – FIBERGLASS DOORS 08 16 13-1

PART 1 – GENERAL

1.1 SUMMARY

A. This section includes information on fiberglass doors

1.2 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

A. Section 08 71 00 - Finish Hardware: Finish hardware templates and products to be installed by this Section
B. Section 08 88 00 – Special Function Glazing: Glass products to be installed by this Section

1.3 REFERENCES

A. ASTM E90 - Measurement of Airborne Sound Transmission Loss of Building Partitions
B. ASTM E 2074 - Standard Test Method for Fire Tests of Door Assemblies, Including Positive Pressure Testing of Side-Hinged and Pivoted Swinging Door Assemblies
C. ASTM E413 - Classification for Determination of Sound Transmission Class
D. ASTM D882 Standard Test Method for Tensile Properties of Thin Plastic Sheeting
E. ASTM D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
F. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
G. ASTM D256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics
H. ASTM D792-00 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
I. ASTM D1761 Standard Test Methods for Mechanical Fasteners in Wood
J. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
K. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics
L. NFPA 80 - National Fire Protection Association Pamphlet 80, Fire Doors and Windows
M. NFPA 252 - National Fire Protection Association Standard Method of Fire Tests for Door Assemblies
N. UL 10B - Underwriter's Laboratories Fire Tests of Door Assemblies
O. Warnock-Hersey - Certification Listings for Fire Doors

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's door core materials and construction; FRP types and characteristics; factory machining criteria, and factory finishing criteria.
B. Manufacturer's Installation Instructions: Indicate special installation instructions
C. Comply with Section 01 33 00

1.5 QUALITY ASSURANCE

A. Obtain fiberglass reinforced plastic doors and frames through one source fabricated from a single manufacturer, including fire rated fiberglass frames
B. Hardware and accessories for all FRP doors as specified in Section 08 71 00 shall be provided and installed by the fiberglass door and frame manufacturer
C. Glass for windows in doors shall be furnished and installed by door and frame manufacturer in accordance with related section, Division 8, Glazing

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with Section 01 60 00
B. Do not deliver FRP doors to Project site until weatherproof storage space is available
C. Protect FRP doors during transit, storage and handling to prevent damage, soiling and deterioration. Comply with requirements of referenced standards and recommendations of NWWDA pamphlet "How to Store, Handle, Finish, Install, and Maintain Wood Doors", as well as with manufacturer's instructions
D. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in wet or damp areas, or in areas where sunlight might bleach veneer. Break seal on-site to permit ventilation
E. Identify each FRP wood door with individual opening numbers that correlate with designation system used on Shop Drawings for FRP doors, frames, and hardware, using temporary, removable, or concealed markings

1.7 PROJECT CONDITIONS
A. Environmental: Do not deliver or install FRP doors until conditions for temperature and relative humidity have been stabilized, and will be maintained in storage and installation areas during remainder of construction period to comply with the following requirements applicable to project's geographical location

1.8 COORDINATION
A. Coordinate Work with door opening construction

1.9 WARRANTY
A. Provide manufacturer's written warranty, including replacement, refinishing, and rehanging, per Section 01795 to the following terms:
1. Life of Original Installation: 25 years
B. Warranty: Warrant materials and workmanship against defects after completion and final acceptance of Work.
1. Repair defects from faulty materials or workmanship developed during the guarantee period, or replace with new materials, at no expense to Owner

PART 2 – PRODUCTS
2.1 MANUFACTURERS
A. Subject to compliance with requirements, provide products from 1 of the following manufacturers:
1. Chem-Pruf Door Co., Ltd., P.O. Box 4560, Brownsville, Texas 78523 Phone: 1-800-444-6924, Fax: 956-544-7943, Website: www.chem-pruf.com
B. Substitutions: Comply with Section 01 25 13

2.2 PRODUCTS
A. 1-Lite fiberglass door by Accurate Dorwin.
B. Custom sliding barn door.

2.3 FRP DOORS: GENERAL
A. Doors shall be made of fiberglass reinforced plastic (FRP) using chemically proven resins resistant to contaminants typically found in the environment for which these specifications are written
B. Doors shall be 1 3/4 inch thick and of flush construction, having no seams or cracks
C. Doors up to 4'-0" x 8'-0" shall have equal diagonal measurements with a maximum tolerance of plus or minus 1/32 inch.
D. Door Plates shall be 1/8 inch thick, molded in one continuous piece, starting with a 25 mil gelcoat of the color specified, integrally molded with at least two layers of 1.5 ounce per square foot fiberglass mat and one layer of 16 ounce per square yard unidirectional roving. This will yield a plate weight of 0.97 lbs per square foot at a ratio of 30/70 glass to resin.
E. Stiles and Rails shall be constructed starting from the outside toward the inside, of a 25 mil gel coat of the color specified followed by a matrix of at least three layers of 1.5 ounce per square foot of fiberglass mat. The stile and rail shall be molded in one continuous piece to a U-shaped configuration and to the exact dimensions of the door. There shall be no miter joints or disparate materials used to form the

once-piece stile and rail.

F. Core material shall be 2 psf expanded polyurethane foam, kraft honeycomb, or mineral core, as scheduled, which completely fills all voids between the door plates
G. Internal Reinforcement shall be firestop of sufficient amount to adequately support required hardware and function of same
H. Finish of door and frame shall be identical in color and texture. At time of manufacture, 25 mil of resin-rich gelcoat must be integrally molded into both the door and frame. Secondary painting to achieve color is not acceptable.

2.4 FABRICATION

A. Factory machine doors for finish hardware per hardware requirements and dimensions. Do not machine for surface hardware
B. Coordinate with Section 08 71 00 - Finish Hardware; for complete door hardware templates and products
C. Refer to Section 08 81 00 - Glazing; for complete glass and glazing requirements
D. Due to the special nature of the material in this section, all related hardware as specified must be furnished and installed by the door and frame manufacturer.
E. Cut-outs for vision panels: Minimum of 6 inches from edge of door and/or other cut-outs for louvers, locks, closers, or other hardware.
F. Use a 10 inch margin between the edge of the door and the edge of any cut-out near the lock area

2.5 FINISH

A. Finish FRP doors and frames per approved Sample

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed until unsatisfactory conditions are corrected.
B. Verify that opening sizes and tolerances are acceptable
C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment

3.2 INSTALLATION

A. Factory trim door height by cutting bottom edges to a maximum of 3/4 inches. Factory trim fire- rated door height at bottom edge only, per fire rating requirements
B. Pilot drill screw and bolt holes
C. Machine cut for hardware. Core for handsets and cylinders
D. Install in accordance with manufacturer’s printed installation instructions
E. Coordinate installation of glass and glazing as specified in Section 08 81 00

3.3 INSTALLATION TOLERANCES

A. Conform to manufacturers written requirements for fit and clearance tolerances
B. Conform to manufacturers written requirements for maximum diagonal distortion

3.4 CLEANING AND ADJUSTING

A. Adjust doors for smooth and balanced door movement
B. Operation: Rehang or replace FRP doors that do not swing or operate freely
C. Finished Doors: Replace FRP doors damaged during installation

3.5 PROTECTION

A. Protect FRP doors as recommended by door manufacturer to assure that FRP doors will be without damage or deterioration at time of Substantial Completion

END FO SECTION 08 16 13

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Control heat gain and heat loss through use of multiple panes, low-e coatings, and gas fills (conserves energy). Use glazing products with high visible light transmittance (increases daylighting performance and occupant health). Select durable window assemblies (conserves resources). Select low-maintenance window assemblies (conserves resources). Select composite, recycled-content frame assemblies (conserves scarce resources). Select low-conductivity frame, sash, and spacer materials (conserves energy).

1.2 DEFINITIONS

A. U-Factor - Btu/hr·sq.ft.·°F: Lower value means higher insulation value.
B. R-Value - Inverse of U-value: Resistance to heat flow. Higher value means higher insulation value.
C. Center-of-Glass Performance Values: U-factor or R-value calculated at center of glass (no "edge effect")
D. Unit Performance Values: U-factor or R-value calculated for entire glazing area (NFRC-certified values based on standard-sized glazing units)
E. Visible Transmittance - Tvis: % of light energy transmitted by given glazing
F. Solar Heat Gain Coefficient (SHGC): Measure of total solar heat transmitted by given glazing
G. Shading Coefficient: Solar heat transmitted relative to a single glass pane
H. Luminous Efficacy Factor - (ke) = Tvis/SC: Ratio of light transmission divided by shading coefficient
I. Solar Reflectance: % of light or solar energy that a given glazing reflects to the outside
J. Tinted Glass: Controls the amount of sunlight admitted
K. Spectrally Selective Glazings: Glazings that selectively transmit sunlight of particular wavelength to minimize unwanted heat gain while having minimal impact on visible light transmission

1.3 SUBMITTALS

A. Window Unit U-factor Performance: Measured in accordance with National Fenestration Rating Council (NFRC) 100, measuring total U-factor for a window averaged over the entire unit (accounting for edge losses).
B. Submit written warranty for hermetically sealed insulating glass unit, agreeing to replace units which fail to maintain hermetic seal of air space, deteriorate, or otherwise fail to perform as required within 10 years after date of Substantial Completion as a result of failure of materials or workmanship.

1.4 ENERGY EFFICIENCY

A. Glazing Insulation Performance for heating climates: Glazing system shall meet or exceed the following unit U-factors based on NFRC standards: Multiple low-e coatings or films between interior and exterior panes of glass with argon or krypton gas between the panes: U < 0.20
B. Luminous Efficacy: Glazing shall meet or exceed a luminous efficacy of Ke = 1.0.
C. Sash Insulation Performance: Hollow PVC or fiberglass profile insulated with foam or fiberglass

PART 2 - PRODUCTS

2.1 GLASS GLAZING

A. Insulating Glass: Certified under SIGMA-approved program and meeting CBA Grade requirement
B. Spacers: Select low-conductivity spacers; use one of the following:
   1. Steel-reinforced butyl rubber
   2. Thermally broken aluminum
   3. Polyurethane and silicon foams

2.2 PLASTIC GLAZING

A. Multi-walled extrusions of Acrylic or Polycarbonate: U<0.3

2.3 RELATED GLAZING MATERIALS

A. Low-Emissivity Coatings: Coatings on all glass panes, on face that is not exposed to scratch hazard.
B. Heat-Absorbing Glass - Tinted: Green or blue

C. Gas Fill: Argon or Krypton between all panes

2.4 GLAZING MATERIALS
A. Sealants for Glazing: One-part, gun-grade, white silicone
B. Joint Backer: Diameter size at least 25% larger than joint width; type and material as recommended in writing by glass and sealant manufacturer
C. Glazing Blocks and Spacers: Closed-cell neoprene complying with ASTM C509, in black color
D. Glazing Gaskets for Factory-Glazed Units: Unit manufacturer's standard preformed types and sizes as required
E. Glazing Tape: PVC gasket complying with ASTM D2287
F. Weatherstripping: Specify compression-type weatherstripping for casement and awning window types.

2.5 FINISHES
A. Finishes: Factory-applied finishes are typically more durable and release fewer solvents to the environment than field-applied finishes.
B. Claddings:
1. Aluminum: Anodized coating, polyvinylidene fluoride coating, or siliconized polyester coating
2. Metal Frame: Provide thermal breaks for metal framed windows. Specify durable, factory-applied finishes: anodized, polyvinylidene fluoride (Kynar), siliconized polyester.
C. Fiberglass (fiberglass-reinforced polyester): Durable, strong, and thermally stable; coefficient of thermal expansion similar to that of glass, thus longer warranty on seal of rare gases. Thermoset plastics are difficult to recycle. Emissions contribute to indoor air quality problems, and manufacture contributes to air pollution. Fiberglass windows typically come with a factory-applied finish but may require periodic painting.

2.6 CURTAIN WALL SYSTEMS
A. High-Performance Glazing with unit U-factor < 0.2: Triple glazing with three low-e coating[s]
B. Integrated Photovoltaic Glazing: Thin-film photovoltaic modules on glass substrate (available products with 5% transmissivity)
C. Metal Framing: Provide thermal break.

PART 3 - EXECUTION
3.1 INSTALLATION
A. Compression Gaskets: Miter-cut at corners and install in manner recommended by gasket manufacturer to prevent pull-away at corners.
B. Close and seal tightly all partly used sealant containers and store protected in well-ventilated, fire-safe area at moderate temperature.

3.2 WASTE MANAGEMENT
A. Separate float glass and place in designated areas for reuse or recycling (cannot be recycled with beverage-container glass).
B. Separate tempered glass for use as aggregate or nonstructural fill.
C. Separate plastic materials and place in designated areas for reuse or recycling (if recycling options are available locally).
D. Separate corrugated cardboard in accordance with the Waste Management Plan and place in designated areas for recycling.

END OF SECTIONS 08 54 13

PART 1 – GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. This skylight is deliberately used to generate heat in a solar chimney for passive drying and ventilation, so the usual cautions below don't apply. But for a skylight in a typical conditioned space you would:
   1. Specify glazing to control heat gain, heat loss, and glare.
   2. Specify thermally insulated frames.
   3. Provide operable skylights to allow for venting.

1.2 SUBMITTALS

A. Provide Third party tests or manufacturer's data on overall unit U-value, SHGC, durability, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Skylights:

B. Glazing: Comply with local codes (if glass, tempered or laminated for safety?).
   1. Glass: Tempered, Low-E2 for solar chimney skylight to maximize solar gain.
   2. Polycarbonate: Contains toxic Bisphenyl A, so should be avoided or used sparingly. Doesn't pose a breakage hazard overhead, is durable, lightweight and easy to handle large sheets, can be clear or translucent (to prevent space from overheating), and when made as a multi-walled extrusion can give a low U-value affordably. Post-competition, it might be desirable to use multi-walled extruded plastic (either acrylic or polycarbonate) for removeable glazing to transform the interior courtyard into an unconditioned greenhouse in winter.

C. Frames:
   1. Pultruded Fiberglass
   2. Aluminum: Provide thermal break

D. Operators for ventilating skylight in temporary greenhouse only – solar chimney would vent through HRV unit to exhaust humidity w/out loosing too much temperature, thus that skylight can be fixed:
   1. Manual: Pole-operated crank
   2. Power-operated

E. Felt Underlayment: Minimum 30% recycled fiber content.

F. Flashing: Compatible with roofing material

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT

A. Collect metal scrap and place in designated area for recycling.

END OF SECTION 08 60 00

PART 1 - GENERAL

1.1 SUMMARY

A. Door hardware.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION:

A. Furnish cylinders to sections:

1.3 RELATED SECTIONS

A. Conduit and power connections: Division 26

1.4 REFERENCES

A. ADA - Requirements for Making Buildings and Facilities Accessible To and Usable by Physically Disabled People.

1.5 SUBMITTALS

A. Shop Drawings: Indicate dimensioning, general construction, specific modifications, component connections, anchorage methods, hardware, and installation procedures, including specific requirements indicated.
   1. Submit 1 complete reproducible copy of a hardware schedule
      a. List groups and suffixes in proper sequence.
      b. Completely describe door and list architectural door number.
      c. Vertical or horizontal schedules only are acceptable.
   2. Upon review and acceptance of Hardware Schedule, develop keying schedule in consultation with Owner. Submit copy to Architect for information only.

C. Templates:
   1. Submit templates and "reviewed schedule" to door and frame supplier and others as applicable
   2. Templates, wiring schematics and "reviewed schedule" of electrical items to electrical for coordination and verification of voltages and locations

D. Keying Schedule:
   1. Upon review and acceptance of Hardware Schedule, develop Keying Schedule in consultation with Owner.
   2. Submit 1 copy to Architect for information only.

E. Manufacturer's parts lists and templates

F. Samples: 1 Sample of hinge, latch-set, and closer illustrating style, color, and finish
   1. Samples: Will be returned to supplier

G. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention

H. Electrical Wiring Diagrams:
   1. Provide complete electrical wiring diagrams for each opening receiving electrified hardware items. Show where and how each item of electrified hardware is to be connected
   2. Provide wiring diagrams with hardware submission for approval by Architect, and also with hardware items being delivered to Project site

1.6 OPERATION AND MAINTENCE DATA

A. Operating and maintenance manuals:
   1. Maintenance instructions for each item of hardware
   2. Catalog pages for each product
   3. Name, address, and phone number of local representative for each manufacturer
   4. Parts list for each product
   5. Copy of final hardware schedule
   6. Copy of final keying schedule
   7. Provide special wrenches and tools applicable to each different or special hardware component
   8. Provide maintenance tools and accessories supplied by hardware component manufacturer

1.7 QUALITY ASSURANCE
A. Comply with Section 01 43 00
B. Perform Work per the following requirements:
1. ADA - Requirements for Making Buildings and Facilities Accessible to and Usable by Physically Disabled People.
C. REGULATORY REQUIREMENTS
1. Conform to governing local codes for requirements applicable to fire-rated doors, frames and hardware.
2. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated
3. Accessibility Requirements: Provide door lever handles or cross bars with knurled or other similar approved markings to doors to stairs (other than exit stairs), loading platforms, boiler rooms, stages, and doors serving other hazardous locations per local governing building codes.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Comply with Section 01 16 00
B. Package hardware items individually. Label and identify each package with door opening code to match hardware schedule.
C. Deliver keys to Owner by certified mail or direct hand carry direct from hardware supplier
D. Deliver hardware to be installed during door fabrication to the applicable manufacturer

1.9 WARRANTY
A. Warranty: Warrant materials and workmanship against defects including coverage for operation of specified hardware, after completion and final acceptance of Work
B. Repair defects from faulty materials or workmanship developed during guarantee period, or replace with new materials, at no expense to Owner
C. Replace shortages and incorrect items with correct materials at no additional cost to Owner
D. Replace shortages and incorrect items with correct materials at no additional cost to Owner
E. At completion of Project, coordinate with qualified factory representative to inspect door closer installations. After this inspection, send certified letter to Architect reporting on conditions, verifying that closer has been properly installed and adjusted

PART 2 – PRODUCTS
2.1 PIVOT SETS
A. Provide pivot sets complete with oil-impregnated top pivot unless indicated otherwise

2.2 PROTECTIVE PLATES
A. Where protective kickplates (KP) are specified in the Hardware Schedule, furnish plates 2 inches less than door width and 10 inches in height unless noted otherwise. Where bottom rail dimension of the door is too small to accommodate 10 inch height, provide kickplate 1 inch less than rail height
B. Material: 0.050 inch thick, countersunk for screws, and beveled 4 edges

2.3 ACCESSORIES AND ATTACHMENTS
A. Furnish necessary hardware accessories, such as wood or machine screws, bolts, nuts, anchors, toggle bolts, and other fasteners, each of the type, size, material, and finish, for its intended purpose and each according to material to which hardware is being applied.

2.5 INTERIOR POCKET DOOR SYSTEM
A. Acceptable manufacturers: 3Form

2.6 INTERIOR SLIDING DOOR SYSTEM
A. Interior sliding door system by 3Form.
B. Track: The track included with the kits is pre-fabricated with countersunk holes spaced every 16" and 2 holes in the center of the track for attachment of the double stop. If you will be installing single

stops on either end or changing the location of the double stop, the track will need to be fabricated in the field to your specific requirements.

1. Additionally, each track is fabricated with holes on either end and ships with locating dowel pins. This allows 2 tracks to be joined together when longer spans of track are required.

C. Bottom roller (flush mount vs surface mount)
   1. The bottom roller is designed primarily to be flush mounted in the floor. as such, the dimensions noted in this document assume a flush mount condition. additionally, the floor receiver should also be recessed when installed.
   2. If you wish to install the bottom roller in a surface mount condition, please be aware the puck may rotate over time resulting in the bottom rollers rotating away from the panel. We recommend using a small piece of strong double sided tape, such as 3M vHb, or other construction adhesive on the bottom of the roller to prevent the puck from rotating.

D. ADA Compliance
   1. Per the Department of Justice ADA regulations, the following guidelines should be considered in the design of your custom Slide solution when used to treat doorway openings. (See http://www.usdoj.gov/crt/ada/reg3a.html#anchor-15677 for more information and diagrams).
      a. 4.13.5 clear Width. Doorways shall have a minimum clear opening of 32 in (815 mm) with the door open 90 degrees, measured between the face of the door and the opposite stop.
      b. 4.13.9 Door Hardware. Handles, pulls, latches, locks, and other operating devices on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate.
   2. Lever-operated mechanisms, push-type mechanisms, and u-shaped handles are acceptable designs. When sliding doors are fully open, operating hardware shall be exposed and usable from both sides. Hardware required for accessible door passage shall be mounted no higher than 48 in (1220 mm) above finished floor.
   3. Standard configurations kits a and b currently provide a pre-determined travel of 38 1/2" from open to close position. When installed over a single door opening, the door handle is not available from both sides in the open and closed position. If an ADA compliant solution is required, please consult your 3form sales rep to customize your Slide solution to the opening you are treating to ensure the requirements above are met

2.7 MISCELLANEOUS ITEMS

A. Miscellaneous items include lever handles (ADA compliance), pocket door handle, 3Form handles, hinges, mortise lock, window hardware, etc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of Work. Do not proceed withunsatisfactory conditions.
B. Verify that doors and frames are ready to receive Work and dimensions are as indicated on approved Shop Drawings
C. Verify that electric power is available to power operated devices and of the correct characteristics

3.2 INSTALLATION

A. Install hardware per manufacturer's instructions
B. Prior to completion of Project, ascertain that door closers are in adjustment so closer completes its full closing cycle in less than 4 to 6 seconds without abrupt change of speed between "Sweep" and "Latch" speeds. Verify that levers are free from binding. Ensure that latchbolts and dead bolts are engaged into strike and hardware is functioning. Turn over wrenches and adjusting tools, provided with hardware.
C. Mounting heights must comply with ADA
D. Clean hardware and remove tags and wrappings from project site
E. Do not permit adjacent work to damage hardware of finish

END OF SECTION 08 71 00

PART 1 – GENERAL

A. This Section includes information for 3Form Chroma panels, to be used for interior doors and fold-down seat in bathroom.

PART 2 - PRODUCTS

2.1 PRODUCT DESCRIPTION

A. 3form chroma offers unique aesthetics and performance for horizontal and lighting applications. The product clarity offers designers the ability to create beautiful edge-lit pieces. Available in thick-gauge formats, 3form chroma is colored with 3form color infusion and UV technologies to take color to new “sights”.
B. 3form chroma is produced from cast polymethyl methacrylate (PMMA) resin that offers excellent optical clarity. The material is available in thick-gauge formats that results in rigid panels suitable for many horizontal applications. The moderate flammability of the material limits its interior use to lighting specific and horizontal surface applications.
C. Color: Refined: Valley Mist
   1. Custom colors are available. All colors available in UV. Color infusion limited to 1/2" and 1" gauges only

2.2 FEATURES AND BENEFITS

A. Maximum optical edge quality and light transmission—great for edge lighting
B. Excellent rigidity for providing sturdiness in horizontal applications
C. Surface is able to be completely refinished to maintain product “newness”
D. Qualifies for 3form "reclaim" - keeping end-of-life material out of landfills

2.3 PANEL SIZES AND TOLERANCES

A. All dimensions and squareness (standard or custom) are subject to a +/- 1/8" (3mm) tolerance.
B. Gauge tolerances are an inherent part of working with resin. Given the unique casting process for 3form chroma a given gauge is subject to a +/- 10% thickness tolerance. If your application requires a tighter gauge tolerance, please notify your 3form Representative.

PANEL SIZE TABLE	
NOMINAL GAUGE	SIZE(S)
1/4" (6mm) UV only	4' x 8' (1.2m x 2.4m)
3/8" (9mm) UV only	4' x 8' (1.2m x 2.4m)
1/2" (12mm)	4' x 8' (1.2m x 2.4m), 4' x 10' (1.2m x 3m)
1" (25mm)	2' x 8' (.6m x 2.4m)*, 4' x 8' (1.2m x 2.4m), 4' x 10' (1.2m x 3m)
2" (50mm) UV only	2' x 8' (.6m x 2.4m)*, 4' x 8' (1.2m x 2.4m)

*Sheet format is additionally subject to a +0 / -1/4" (6mm) cut tolerance on 2' width (.6m).

2.4 SPECIFICATIONS

A. FLAMMABILITY & SMOKE TEST RESULTS – BUILDING CODE APPROVALS
   1. 3form chroma conforms to the 2003 International Building Code for light-transmitting plastics. The provisions of these codes provide adequate regulation for most applications of light-transmitting plastics (data based on 0.125" thickness):

B.

TEST	3FORM CHROMA RESULT	3FORM CHROMA	RESULT
ASTM D 2843	Smoke Density	10%	PASS Less than 75
ASTM D 635	Flame Spread	Rate of burning: 1.0 in/min	PASS CC2
ASTM D 1929	Self-ignition Temperature	910°F	PASS Greater than 850°F

C. PANEL WEIGHT AT VARIOUS GAUGES

THICKNESS	WEIGHT FLUX
1/4" (6mm)	1.6 lb/ft2 (7.8 kg/m2)
3/8" (9mm)	2.3 lb/ft2 (11.2 kg/m2)
1/2" (12mm)	3.1 lb/ft2 (15.1 kg/m2)
1" (25mm)	6.2 lb/ft2 (30.2 kg/m2)

2" (50mm)	12.4 lb/ft2 (60.5 kg/m2)

D. EXPANSION/CONTRACTION ALLOWANCES
   1. Like all resin products, 3form chroma will expand and contract nominally with fluctuations in temperature.
   2. The following formula provides allowances that should be made in framed or fitted applications:
      a. Longest length of panel (inches) x temperature change of the sheet (°F) x 0.00004 = Amount of Linear Expansion/Contraction (inches)
      b. EXAMPLE: A 48" x 96" panel that experiences a 50°F temperature change will expand/contract: 96 inches x 50 degrees x 0.00004 = 0.192 inches
   3. Installers should take extra precautions if installation is occurring before the HVAC systems are operational.
   4. Allowances should also be made in the following situations:
      a. Fastening points
      b. Holes for standoffs and other hardware
      c. Meeting points for multiple sheets of 3form chroma

E. EXTERIOR EXPOSURE PERFORMANCE
   1. Though 3form chroma was designed for use in interior applications, it is an excellent choice for exterior applications when incorporated with 3form UV stable color technology. All UV stable chroma colors are designated with "UV" after the color name. Should your application be for exterior use, please notify your 3form sales representative.

F. DEFLECTION
   1. 3form chroma will exhibit different amounts of deflection given a variety of factors: fastening techniques, loads, gauges and panel dimensions to list a few. Your 3form representative can assist you with general deflection guidelines for your application. If your application has specific engineering requirements, please contact the 3form Product Technology group for additional direction.

G. HEAT FORMING
   1. 3form chroma can be heated and formed to produce simple or even complex curves and shapes. The minimum inner radius for a heat formed shape should not be less than 3 times the sheet thickness. The optimal forming temperature ranges from 300º- 330ºF.

H. COLD BENDING
   1. Though 3form chroma is commonly used in flat or heat curved applications, the polymeric nature of the material allows a minimal amount of cold bending for a given panel. The table below shows the minimum suggested radius for 3form chroma at a given gauge:

I.

THICKNESS	MINIMUM BEND RADIUS
0.250" (6mm)	115" (292 cm)
0.375" (9mm)	170" (432 cm)
0.500" (12mm)	225" (571 cm)
1.000" (25mm)	450" (1143 cm)
2.000" (50mm)	900" (2286 cm)

J. EDGE FINISHING
   1. Edges of 3form chroma panels are able to be machined or routed into a variety of different forms. In addition to a straight edge, edges may accept beveling, rounding, etc. Additional finishing, such as sanding or polishing, can also be provided to some edges.

K. REFINISHING
   1. One of the unique benefits of 3form chroma is its ability to be refinished. If 3form chroma needs to be refinished for any reason, the panels may be renewed by sanding. Begin by dry sanding with a course grit paper (100 or 150 grit) to remove blemishes/scratches. Continue sanding with gradually finer grit papers until the surface is smooth and level and the blemish/scratches are removed. Complete the refinishing process by sanding with a 220 grit paper to attain a matte finish.
   2. Even finer grit papers may be used to attain a satin or semi-polished appearance. With papers greater than 400 grit, wet sanding (with water) should be employed.
   3. Be sure to keep sanders in motion at all times when refinishing surfaces or edges. Only use light pressure with power sanders in order to maintain evenness and avoid overheating of the sheet surface.

2.5 SELECT PHYSICAL PROPERTIES

MECHANICAL	ASTM METHOD	TYPICAL VALUES	
		US CUSTOM	METRIC
specific gravity	D792	1.19	759 kg/cm²
tensile strength	D638	10,000 psi	
elongation at rupture	D638	4.0%	
modulus of elasticity	D638	400,000 psi	28.1x103 kg/ cm²
flexural strength (rupture)	D790	16,000 psi	1123 kg/cm²
compressive strength (yield)	D695	17,500 psi	1230 kg/cm²
compressive deformation (4000 psi (281 kg/cm2), 122°F (50° C), 24 hours)	D621	≤0.85%	
shear ultimate strength	D732	10,000 psi	703 kg/cm²
impact strength (charpy method)	D256		
	notched	2.1 lbf*in/in	0.4 kgf*cm/cm
	un-notched	107 lbf*in/in	20 kgf*cm/cm
izod notched impact strength	D256	≤0.25 ft-lb/in	≤13.3 J/m
rockwell hardness	D785	M-103	
barcol hardness	D2583	49	
residual shrinkage (internal strain)	D702	2%	
OPTICAL			
refractive index	D542	1.49	
light transmission (total)	D1003	92%	
haze	D1003	<1%	
THERMAL			
forming temperature		300-330°F	149-157°C
deflection temperature (264 psi [18.6 kg/cm²])	D648	99°C	210°F
vicat softening point	D1525	239°F	115°C
max recommended service temp		150°F	66°C
coefficient of thermal conductivity (k-factor)	cenco-fitch	1.3 btu/(hr)ft²(°F)	0.19 w/m°K
coefficient of thermal expansion D696			

°F	10^{-5}(in/in/°F)	°C	10^{-5}(mm/mm/°C)
-40	2.9	-40	5.22
-20	3.0	-29	5.40
0	3.2	-18	5.76
+20	3.4	-1	6.12
+40	3.7	+4	6.66
+60	4.0	+16	7.20
+80	4.3	+27	7.74
+100	4.7	+38	8.46
+120	5.1	+49	9.18
+140	5.4	+60	9.72

flammability (1/8 inch [3mm] thick)	D635	1.0 in/min	25 mm/min
self-ignition temperature	D1929	910°F	490°C
specific heat @ 77°F [25°C]		428 cal/lb°F	0.35 cal/g°C
smoke density rating	D2843	10%	

2.6 CHEMICAL RESISTANCE OF 3FORM CHROMA TO SELECT COMPOUNDS

A. The following table provides indicative performance of the chemical resistance characteristics of clear 3form chroma panels. The following codes are used to describe the chemical resistance characteristics:
   1. R = RESISTANT: Indication that 3form *chroma* is able to withstand the identified compound for long exposure periods up to 120°F.
   2. LR = LIMITED RESISTANCE: 3form chroma is only able to resist affect when in contact with this compound for short periods at room temperature. It is advised that further determination of the affect of the substance in your particular application be further tested.
   3. N = NOT RESISTANT: 3form chroma is not resistant to the compound. The material will swell, craze, haze, dissolve or experience some physical change when exposed to this substance.

B. Polymer materials are affected by chemicals in different ways. Factors that initiate a change in performance or appearance when exposed to chemicals can be attributed to fabrication methods, exposure conditions, concentration of chemical substances or exposure duration of certain substances. Such factors can even influence the final affect on substances that 3form chroma is considered "Resistant" to by this method. Further details are explained below:
   1. FABRICATION: Stresses generated from sanding, grinding, drilling, polishing, machining, sawing and/or forming (hot or cold).
   2. EXPOSURE :Exposure duration, stresses imparted during the application life-cycle due to loads, temperature changes, heat, environments, etc.
   3. APPLICATION OF CHEMICALS: Application from contact, rubbing, wiping, spraying, soaking, etc. Also having an affect is the relative concentration of the chemical in question.

CHEMICAL	CODE	CHEMICAL	CODE
acetic acid (5%)	R	ammonium hydrozide (conc.)	R
acetic acid (glacial)	N	aniline	N
acetic anhydride	LR	battery Acid	R
acetone	N	benzaldehyde	N
acrylic paints and lacquers	LR	benzene	n
ammonia (aqueous solution)	R	bituminous emulsion	n
ammonium chloride (saturated)	R	bromine	N
ammonium hydroxide (10%)14	R	butanol	LR
butyl acetate	N	glycol	R
calcium chloride (saturated)	R	heptane	R
calcium hypochlorite	R	hexane	R
carbon tetrachloride	N	hot bitumen	LR
cement	R	hydrochloric acid	R
chlorine water	LR	hydrofluoric acid (40%)	N
chloroform	N	hydrogen peroxide (3%)	R
chromic acid (40%)	N	hydrogen peroxide (28%)	N
citric acid (10%)	R	iso octane	R
cottonseed oil (edible)	R	isopropyl alcohol	LR
detergent solution	R	kerosene	R
diesel oil	R	lacquer thinner	N
diethyl ether	N	lactic acid (80%)	LR
dimethyl formamide	N	methane	R
dioctyle formamide	N	methyl alcohol (50%)	LR
ethyl acetate	N	methyl alcohol (100%)	N
ethyl alcohol (50%)	LR	methyl ethyl ketone (MEK)	N
ethyl alcohol (95%)	N	methylene chloride	N
ethyl dichloride	N	mineral oil	R
ethylene gycol	R	mortar	R
2-ethylhexyl sebacate	R	motor fuel (benzene-free)	R
formaldehyde (40%)	R	motor fuel (with benzene)	N
formic acid (2%)	R	muriatic acid (20%)	R
formic acid (40%)	LR	nitric acid (10%)	R
gasoline (regular, leaded)	LR	nitric acid (40%)	LR
glycerine	R	nitric acid (conc.)	N
glycerol	R	oil paints (pure)	R
olive oil	R	sodium hydroxide (60%)	R
oxygen	R	stearic acid	R
ozone	R	sulfuric acid (3%)	R
phenol solution (5%)	N	sulfuric acid (30%)	R
phosphoric acid (10%)	R	sulfuric acid (conc.)	N
plaster of paris	R	thinners (general)	N

soap solution (ivory)	R	toluene	N
sodium carbonate (2%)	R	tricholoroethylene	N
sodium carbonate (20%)	R	turpentine	LR
sodium chloride (10%)	R	urine	R
sodium hydroxide (1%)	R	water (distilled)	R
sodium hydroxide (10%)	R	xylene	N

PART 3 – EXECUTION

3.1 CLEANING INSTRUCTIONS

A. 3form chroma, like all thermoplastic materials should be cleaned periodically. A regular cleaning program will help to maintain the aesthetics and life of the material.
B. Rinse or wipe the sheet with lukewarm water. Remove dust and dirt from 3form chroma with a damp, soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. Rinse or wipe the 3form chroma again thoroughly with lukewarm water. For more stubborn stains, dirty spots or grease, surface cleaners like Fantastik® or Formula 409® also work well. After all cleaning steps, be sure to rinse thoroughly with lukewarm water.
C. Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form chroma. Also avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner or other strong solvents.

3.2 WARNINGS/CAUTIONS

A. Do Not:
   1. Use squeegees or scrapers as they may scratch the sheet
   2. Use scouring compounds or solvents such as: acetone, gasoline, benzene, carbon tetrachloride, or lacquer thinner to clean the sheet.
   3. Use abrasives or highline alkaline cleaners
   4. Use a dry cloth or a cloth of synthetic fiber such as rayon or polyester as they may scratch the sheet.
B. Do:
   1. Use warm water, mild detergent and a soft cloth or chamois
   2. Rinse surface thoroughly after cleaning with lukewarm water
   3. Blot dry with slightly damp, soft cloth or chamois
C. IMPORTANT: If a cleaning material is found to be incompatible in a short-term test, it will usually be found to be incompatible in the field. The converse, however, is not always true. Favorable performance is no guarantee that actual end-use conditions have been duplicated. Therefore, these results should be used as a guide only and it is recommended that the user test the products under actual end-use conditions.

END OF SECTION 08 84 13

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes:
   1. SageGlass® electrically tintable insulating glass units for dynamic light and heat control.
B. Related Sections:
   1. Division 8 – Openings.
   2. Division 25 - Integrated Automation.
   3. Section 26 09 00 – Instrumentation and Control for Electrical System.
   4. Division 26 - Electrical.

1.2 DEFINITIONS

A. 2-ply Laminated Glass: 2-sheets of monolithic glass bonded together with plastic interlayer by heat and pressure.
B. Bite: Dimension by which edge of glass product is engaged into glazing channel.
C. Fenestration: Openings in building's envelope including windows, doors, and skylights.
D. Framing System: Basic rigid supporting structure of window.
E. Frame Wire Harness: Wire that runs through framing system and connects IGU pigtail to low voltage wiring on interior of building.
F. Glazing System: Soft material used in framing system.
G. IGU Pigtail: Wire that extends from individual insulated glass units.
H. IGU: Insulated Glass Unit.
I. Inboard Lite: Pane of IGU that faces interior of building.
J. Laminate Inner-Ply: Glass pane in laminated glass construction that faces exterior of building.
K. Laminate Outer-Ply: Glass pane in laminated glass construction that faces interior of building.
L. Outboard Lite: Pane of IGU that faces exterior of building.
M. Performance Characteristics:
   1. Center-of-Glass Characteristics: Performance values that take only center portion of IGU into account and not framing members.
   2. Fenestration Performance: Performance based on total fenestration (center-of-glass and framing members). Values that can be validated and certified by National Fenestration Rating Council (NFRC).
N. Sealing Insulating Glass Unit Surfaces and Coating Orientation:
   1. Surface 1: Exterior surface of outer pane.
   2. Surface 2: Interior surface of outer pane.
   3. Surface 3: Exterior surface of inner pane.
   4. Surface 4: Room side surface of inner pane.
O. Tinted: On state, with lowest visible light transmission.
P. Untinted: Off state, with highest visible light transmission.

1.3 SYSTEM DESCRIPTION

A. Design Requirements:
   1. SageGlass® electrically tintable insulating glass units shall be operated by a SageGlass® control system as specified in Section 26 09 00.
   2. Framing and Glazing Systems:
      a. Designed to accommodate IGU components below:
         i. Edge clearance: 1/4 inch (6 mm)
         ii. Bite clearance: 5/8 inch (16 mm)
         iii. Face clearance: 3/16 inch (5 mm)
      b. Accommodate controls wiring.
      c. Has glazing materials that is compatible with materials of SageGlass® IGU.
      d. Provide glazing and framing systems capable of withstanding normal thermal movements, wind loads, and impact loads, without failure, including loss due to defective manufacture, fabrication, and installation, deterioration of glazing materials, and other defects in construction.

i. Normal Thermal Movement: Resulting from ambient temperature range of 120 degrees F (67 degrees C) and from consequent temperature range within glass and glass framing members of 180 degrees F (100 degrees C).
ii. Deterioration of Laminated Glass: Development of manufacturing defects including edge separation or delamination that materially obstructs vision through glass.

3. Provide glass products in thicknesses and strengths (annealed or heat-treated) required to meet or exceed the following criteria based on Project loads and in-service conditions per ASTM E1300.
   a. Select minimum thickness of annealed or heat-treated glass products to ensure probability of failure does not exceed the following:
      i. 8 breaks per 1000 for glass installed vertically or not over 15 degrees or more from vertical plan and under wind action.
      ii. 1 break per 1000 for glass installed 15 degrees or more from vertical plane and under action of wind, snow, or both.

1.4 SUBMITTALS

A. Product Data: Manufacturer's Product Data sheets including installation instructions.
B. Documentation indicating compliance with ASTM E2141-02, Chromogenic fenestration standard as verified by third party test laboratory such as National Renewable Energy Laboratory (NREL).
C. Shop Drawings: Indicate framing system and accommodations for wiring paths, connectors, routing, and exit from framing system.
D. Structural Calculations: Provide structural calculations for framing system certified by structural engineer licensed in the state in which Project is located.

1.5 QUALITY ASSURANCE

A. Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this section or referenced standards.
   1. GANA Publications
   2. AAMA Publications
   3. IGMA Publications
B. Safety glass products in the US are to comply with CPSC 16 CFR Part 1201 for Category II Materials.
C. Glass thermal and optical performance properties shall be based on calculations from the current LBNL WINDOW 5.2 computer program.
D. Provide glass that is heat-treated by horizontal (roller hearth) process with inherent roller wave
E. distortion parallel to short edge of glass as installed when specified.
F. Installer Qualifications: Acceptable to SAGE Electrochromics and capable of preparing data for glazed framing systems, based on testing and engineering analysis of SAGE Electrochromics' standard units in assemblies similar to those indicated for this Project.
G. Pre-Installation Meetings: Conduct pre-installation meeting/teleconference with the following parties in attendance:
   1. Architect, Contractor, glazing contractor, framing manufacturer, SageGlass® IGU and Controls manufacturer, electrical contractor, and other parties related to Work of this Section, to review procedures, schedules, safety, and coordination with other elements of Project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instruction for receiving, handling, storing, and protecting materials.
B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer.
D. Exercise care to prevent edge damage to glass, wire, and coatings on glass.
E. Where insulating glass units will be exposed to substantial altitude changes, avoid hermetic seal ruptures by complying with manufacturer's recommendations for venting and sealing.

1.7 PROJECT / SITE CONDITIONS

A. Verify frame channel dimensions are adequate for wire runs as designed.

B. Environmental Requirements:

1. Ensure that substrate surface and ambient air temperature are minimum of 40 degrees F (5 degrees C) and rising at application time and remain above 40 degrees F (5 degrees C) for at least 24 hours after application.

1.8 WARRANTY

A. Warrant SageGlass® IGUs against defects in material or workmanship causing material obstruction of vision as a result of fogging or film formation of the internal glass as a result of failure of the hermetic seal for a period of ten years from the date of shipping of the SageGlass® IGUs from the Manufacturer.

B. Warrant SageGlass® electrochromic glass against defects in material or workmanship for a period of five years from the date of shipping of the SageGlass® electrochromic glass from the Manufacturer.

C. Warrant SageGlass® Controls against defects in material or workmanship for a period of five years from the date of shipping of the SageGlass® Controls from the Manufacturer.

1.9 MAINTENANCE

A. Extra Materials:

1. Furnish 1 percent (minimum of 1 IGU) of each size and type of IGU.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. SAGE Electrochromics, Inc.
One Sage Way.
Faribault, MN 55021.
Telephone: 877-SAGE-EC1. (877-724-3321)
Fax: 1-507-333-0145.
E-mail: commercialsales@sage-ec.com or technicalservices@sage-ec.com.
Internet: http://www.sage-ec.com.

2.2 MATERIALS

A. SageGlass® Classic™ Sealed Insulating Glass Units (IGUs):

1. Outboard Lite:
   a. Glass Type: SageGlass® coated clear float glass.
   b. Glass Tint: Variable.
   c. Nominal Thickness: 0.25 in (6 mm) per industry standards.
   d. Heat Treatment: Tempered.
   e. Coating Orientation: Surface No. 2.
2. Air Space:
   a. Spacer Material: Austenitic standard stainless steel.
   b. Nominal Thickness: 0.50 plus/minus 0.02 in (12.5 mm plus/minus 0.5mm).
   c. Wall Thickness: 0.008 inch (0.2 cm).
   d. Gas Fill: 90 percent Argon.
   e. Desiccant: 4 sides filled with 100 percent molecular sieve and silica gel blend desiccant.
3. Laminated Inboard Lite:
   a. Outer Ply (Surface 4):
      1) Glass Type: Clear float glass.
      2) Glass Tint: Clear.
      3) Nominal Thickness: 0.125 inch (3 mm).
      4) Heat Treatment: Heat-strengthened.
   b. Interlayer:

1) Interlayer Type: Polyvinyl Butyral.
2) Interlayer Tint: None.
3) Nominal Thickness: 0.06 inch (1.52 mm).

c. Inner Ply (Surface 3):
1) Glass Type: Clear float glass.
2) Glass Tint: Clear.
3) Nominal Thickness: 0.125 inch (3 mm).
4) Heat Treatment: Heat-strengthened.

4. Pigtail:
a. 2-conductor sheathed cable type CM/CL2, 0.15 inch nominal OD.
b. Molex 52213-0211 2-pin connector.

5. Untinted Performance Characteristics (Center of Glass):
a. Visible Transmittance: 62 percent.
b. Interior Visible Reflectance: 14 percent.
c. Exterior Visible Reflectance: 21 percent.
d. Summer U-factor (U-value): 0.28.
e. Winter U-factor (U-value): 0.28.
f. Krochman Damage Function (KDF): 15 percent.
g. Solar Heat Gain Coefficient (SHGC): 0.48.

6. Tinted Performance Characteristics (Center of Glass):
a. Visible Transmittance: 3.5 percent.
b. Interior Visible Reflectance: 10 percent.
c. Exterior Visible Reflectance: 6 percent.
d. Summer U-factor (U-value): 0.28.
e. Winter U-factor (U-value): 0.28.
f. Krochman Damage Function (KDF): 1.7 percent.
g. Solar Heat Gain Coefficient (SHGC): 0.09.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Verification and Conditions
1. Verify that site conditions are acceptable for glass installation.
2. Verify openings for glazing are correctly sized and within tolerance.
3. Verify that functioning weep system is present.
4. Verify that minimum required face and edge clearances are being met.
5. Verify that glazing channels and recesses are clear and free of obstructions, weeps are clear, and channels and recesses are ready for glazing.

B. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation:
1. Clean and prepare glazing channels and other framing members to receive glass and wire.
2. Remove coatings and other harmful materials that will prevent glass and glazing installation required to comply with performance criteria specified.

3.3 INSTALLATION

A. Install products using recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in the "GANA Glazing Manual".

B. Verify that IGU secondary seal is compatible with glazing sealants.

C. Install glass in prepared glazing channels and other framing members.

D. Install glass per framing manufacturer’s wiring diagram showing IGU orientation and wire exit point into building. Comply with glass manufacturer’s labels and instructions for glass orientation.

E. Use grommets during installation to protect wire when routing through frame.

F. Verify glazing pocket where IGU Pigtail and Frame Wire Harness connection is made is a dry location.
G. Install setting blocks in rabbets as recommended by referenced glazing standards in GANA Glazing Manual and IGMA Glazing Guidelines and manufacturer's Glazing Guidelines.
H. Provide bite on glass, minimum edge and face clearances, and glazing material tolerances recommended by GANA Glazing Manual and as approved by glass manufacturer.
I. Provide weep system as recommended by GANA Glazing Manual.
J. Distribute weight of glass unit along edge rather than at corners.
K. Comply with framing manufacturer's and referenced industry recommendations on expansion joints and anchors, accommodating thermal movement, glass openings, use of setting blocks, use of glass spacers, edge blocks, and installation of weep systems.
L. Protect glass from edge damage during handling and installation.
M. Prevent glass from contact with contaminating substances that result from construction operations, such as weld spatter, fireproofing, or plaster.
N. Once electronically tintable IGUs have been removed from SAGE Electrochromics' packaging, remove protective film within 90 days of exposure to sunlight or other UV light sources.

3.4 ADJUSTING

A. Remove glass that is broken, chipped, cracked, or damaged in any way, and replace with new materials.

3.5 CLEANING

A. Clean glass inside and outside, immediately after installation and sealants have cured, per SAGE Electrochromics' written recommendations.
B. Remove temporary protective film from glass. Remove labels and markings from glass.
C. Clean glass per:
1. GANA Glass Informational Bulletin GANA 01-0300 - Proper Procedures for Cleaning Architectural Glass Products.
2. GANA Glass Information Bulletin GANA TD-02-0402 – Heat-Treated Glass Surfaces Are Different.
D. Do not use scrapers or other metal tools to clean glass.

END OF SECTION 08 88 00

Division 09: Finishes

Section 09 29 00 – Gypsum Board
Section 09 30 00 – Tiling
Section 09 64 00 – Wood Flooring
Section 09 91 00 – Paint
Section 09 77 00 – Special Wall Surfacing

SECTION 09 29 00 - GYPSUM BOARD 09 29 00-1

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Minimize waste (conserves resources).
B. Utilize recycled-content materials (conserves resources).
C. Specify gypsum board product made with flue-gas desulfurization (synthetic) gypsum.
D. Avoid premixed joint compounds containing additives (minimizes indoor air quality and pollution problems).
E. Select products that minimize framing (conserves resources).
F. Avoid vinyl-faced gypsum board.
G. Use unfaced board with cellulose fibers embedded in gypsum matrix.
H. Collect scrap for recycling or use as soil amendment.
I. Cut AQUA-TOUGHInterior Panels to size with a utility knife and straight edge.Use a power saw only if equipped with a dust-collection device.Panels may be cut by scoring and snapping or by sawing, working from the face side.
J. When using the score-and-snap method, score the panel twice and snap the panel away from the cut face. The backside of the panels is then broken by snapping the panel in the reverse direction. If a power-operated saw is used, a low-RPM unit with 3-1/2
K. When necessary, use a rasp or SURFORM®to smooth cut edges.Holes for pipes, fixtures and other small openings can be cut out with a saw or a drywall router equipped with a special bit (available from Rotozip Tool Corporation).When a router is used, hold panels away from the wall.
L. Contractors installing tile and tile-setting materials should always follow current ANSI specifications, TCA guidelines and the specifications of the surfacing materials manufacturer.

1.2 SUBMITTALS

A. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Gypsum Board: Specify manufacturers that take back scrap for recycling. Water-resistant and glass-fiber reinforced types may be difficult to recycle.
    a. CertainTeed 1/4" x 1/2" regular gypsum board
B. Recycled content:
C. Paper: 100% post-consumer recycled content
D. Gypsum: Post-industrial and post-consumer recycled gypsum - use highest level that is readily available.
E. Synthetic gypsum: Minimum 95% recycled content
F. Fiber Gypsum Wallboard Panels: Fiber-reinforced gypsum board of recycled paper and gypsum over a recycled paper, gypsum, and perlite core; heavier and more durable than conventional gypsum board with a dense, hard surface less prone to mold growth; 1/2" thick material can span 24", has to be cut or scored on both sides.
G. Thickness: 1/4", 1/2", and 5/8"
H. Fire resistance: 1/2" and 5/8" panels equivalent to Type X, ASTM E119, and CAN/ULC-S101, with Class 1 flame spread, smoke development, and fuel contribution in accordance with ASTM E84 and CAN/ULC-S102
I. Moisture tolerance: After wetting, regains original strength upon drying
J. Joint Reinforcement

K. Fasteners
   a. Corrosion-resistant TYPEW or TYPES®buglehead screws for wood framing (tile surfaces only).
   b. Hot-dipped galvanized roofing nails for wood framing.
   c. TYPES buglehead screws for 25 ga.steel framing.
   d. Corrosion-resistant TYPES-12®buglehead screws for 20-14 ga.steel framing.
L. Adhesives/Mortars—Products:
   a. Meeting ASTM C557.73:multiple purpose adhesives.
   b. Meeting ANSI A136.1:type I organic adhesive.
   c. Meeting ANSI A118.4:latex modified portland cement mortar
M. Tile: Tile shall meet ANSI A137.1

2.2 WALL APPLICATIONS
A. Framing– Space wood and steel framing a maximum of 24” o.c. Framing shall be designed not to exceed L360 deflection for tile and L240 for flexible finishes like paint.
B. Cut panels to size with a utility knife and straight edge. Use a power saw only if equipped with a dust-collection device.
C. Position all ends and edges of panels over framing members, except when joints are at right angles to framing members, as in perpendicular applications or when end joints are back-blocked.
D. Install panels vertically whenever possible. End joints should be loosely fit. Install panels a minimum of 3/8 the floor. Stagger end joints in successive courses with joints on opposite sides of a partition placed on different studs.
E. Attach panels to framing supports by spacing fasteners not less than 3/8 and drive as recommended for specified fastening method. Drive fasteners in field of panels first, working toward ends and edges.
   a. Wood framing – Use corrosion-resistant Type W or TYPES buglehead screws or hot-dipped galvanized roofing nails. Fasteners must be of sufficient length to ensure a minimum 3/4
   b. Steel Framing – Use Corrosion-resistant TYPES or TYPES-12 buglehead screws for 20-12 ga steel framing. When using 25 ga steel framing fasteners should be spaced no grater than 8 to ensure a minimum of 3/8

2.3 RELATED MATERIALS
A. Joint Compound:
   1. Dry mix: Lime compound; all-purpose joint and texturing compound containing inert fillers and natural binders
   2. All-purpose, premixed: Low-VOC, free of antifreeze, vinyl adhesives, preservatives, biocides, and other slow-releasing compounds
   3. Drywall Stops: Galvanized steel (high recycled content) or 100% recycled HDPE with minimum 25% post-consumer recycled content
   4. Joint Tape: Recycled-content paper

PART 3 - EXECUTION
3.1 MATERIALS HANDLING/STORAGE
A. Protect gypsum products from moisture and contaminants. Do not store near materials that may offgas harmful volatile organic compounds, such as solvents and kerosene.
B. All materials shall be delivered in their original unopened packages and stored in an enclosed shelter providing protection from damage and exposure to the elements. Damaged or deteriorated materials shall be removed from the premises.
C. Store panels flat. Panels are heavy and can fall over, causing serious injury or death. Do not move unless authorized.

3.2 INSTALLATION
A. Gypsum Board: Comply with ASTM C840 and GA-216, except where exceeded by other requirements.
   1. Lay out panels to minimize waste; reuse cutoffs whenever feasible.
   2. Select panel sizes to minimize waste. Example - use 54"-wide panels for 9' ceilings.
   3. Minimize framing: Install 5/8" gypsum wall board or 1/2" ceiling board over framing at 24" on

center. Float corners with single studs and drywall clips – only applicable to interior walls & ceilings, not SIPs.

B. Fiber Gypsum Board: Comply with ASTM C840 and GA-216, except where exceeded by other requirements.
   1. Lay out panels to minimize waste; reuse cutoffs whenever feasible.
   2. Select panel sizes to minimize waste.
   3. Install 1/2" fiber gypsum board over ceiling framing at 24" on center.

A. Taping and Finishing:
   1. Tool joints as smoothly as possible to minimize sanding and dust.
   2. Protect workers, building occupants, and HVAC systems from gypsum dust.

3.3 TUB SURROUNDS

A. Panel Application—After tub, shower pan or receptor is installed, place temporary 1/4 around lip of fixture. Pre-cut board to required sizes and make necessary cut-outs. Fit ends and edges closely but not forced together. Install board abutting top of spacer strip. Stagger end joints in successive courses. Fasten panels to wood studs spaced max.24 roofing nails. For steel studs (14-25 ga.),use corrosion-resistant screws. For fastener spacing requirement, refer to table on page two.

B. Seal all openings around pipes, fittings and fixtures with waterproof flexible sealant. Allow areas to dry thoroughly prior to tile application. Wipe excess material from surface of panels. Remove spacer strips but do not caulk the gap at the bottom of panel.

C. A waterproof membrane (ANSI A118.10) must be applied to horizontal surfaces in wet areas

3.4 CEILINGS

A. Framing—Must be capable of supporting the total ceiling system dead load, including insulation, ceramic tile, bonding materials and panels, with deflection not exceeding L/360 of the span for tiled surfaces.

B. Panel Application—Center end or edge joints on framing. Stagger end joints in successive courses. Fit ends and edges closely but not forced together. Fasten boards to framing using recommended fastener table on page one.

3.5 JOINT TREATMENT APPLICATION

A. For Tiled Areas—Embed DUROCKJoint Tape in latex-fortified mortar or latex-based Type I mastic over the joint. Use the same material as specified for tile setting.

B. For Untiled Areas—Embed SHEETROCKJoint Tape in DURABOND Setting-Type Joint Compound and wipe with a joint knife, leaving a thin coating of joint compound over all joints and interior angles. Complete to level of finish specified in project requirements

C. Surfaces should be isolated with surface control joints or other means where:(a) a wall abuts a structural element; (b) construction changes within the plane of the wall

D. Location of control joints is the responsibility of the design professional/architect. Double-framing members at control joints shall be spaced ½ in each flange. Cut end joints square and align for neat fit. Remove protective tape when joint treatment is completed. Do not apply tile or finishes over control joint. For alternate methods of forming control joints, refer to the Gypsum Construction Handbook (USG literature item H17).

3.6 INTERIOR CERAMIC TILE APPLICATION

1. Follow ANSI Specifications and TCA Guidelines

3.7 WASTE MANAGEMENT

A. Separate clean waste gypsum products from contaminants for recycling in accordance with the Waste Management Plan. Do not include wood, plastic, metal, asphalt-impregnated gypsum board, or any gypsum board coated with glass fiber, vinyl, decorative paper, paint, or other finish. Place in designated area and protect from moisture and contamination.

B. Recycle clean waste gypsum products:

C. Return to gypsum board manufacturer, OR

D. Pulverize and apply on-site as soil amendment in accordance with landscape specifications. Do not use products containing glass fiber. Protect granular material from moisture.
E. Separate metal waste in accordance with the Waste Management Plan and place in designated areas for recycling or reuse.

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

MSDS # 54-063-003
Page 1 of 8

United States Gypsum Company
125 South Franklin Street
Chicago, Illinois 60680-4124
A Subsidiary of USG Corporation

Product Safety: 1 (800) 507-8899
www.usg.com
Version Date: October 9, 2003
Version: 1

SECTION 1
CHEMICAL PRODUCT AND IDENTIFICATION

PRODUCT: FIBEROCK® Brand Gypsum Panels - Aqua Tough
SYNONYM: Gypsum board

SECTION 2
COMPOSITION, INFORMATION ON INGREDIENTS

MATERIAL	WT%	TLV (mg/m^3)	PEL(mg/m^3)	CAS NUMBER
Gypsum ($CaSO_4 \cdot 2H_2O$)	>80	10	15(T)/5(R)	13397-24-5
Cellulose	<15	10	15(T)/5(R)	9004-34-6
Parrafin Wax	<2	2(fume)	2(fume)	8002-74-2
Crystalline Silica	<1	0.05(R)	0.1(R)	14808-60-7

(T) – Total (R) – Respirable (NE) – Not Established
Respirable crystalline silica: IARC: Group 1 carcinogen, NTP: Known human carcinogen. The weight percent for silica represents total quartz and not the respirable fraction. The concentration of respirable crystalline silica measured in bulk samples of USG gypsum was less than 0.1 wt.%. Industrial hygiene testing, following the NIOSH Method 7500, did not detect respirable crystalline silica in dust created during the cutting of USG gypsum wallboard panels by both the recommended score and snap technique and with the use of a power saw in a 10ft by 10ft room.
The weight percent for fibrous glass (continuous filament) represents total fibrous glass and not the respirable fraction.

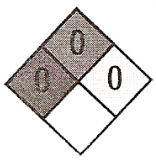
Food and Drug Administration [CFR Title 21, v.3, sec 184.1230] – Calcium Sulfate is Generally Recognized as Safe (GRAS).

All ingredients of this product are included in the U.S. Environmental Protection Agency's Toxic Substances Control Act Chemical Substance Inventory. All components of this product are included in the Canadian Domestic Substances List (DSL).

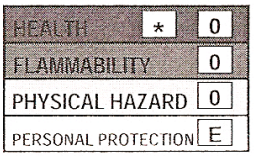
SECTION 3
HAZARD IDENTIFICATION

INFORMATION FOR HANDLING AND IDENTIFICATION OF CHEMICAL HAZARDS

NFPA Ratings:
Health: 0
Fire: 0
Reactivity: 0



HIMS Ratings:
Health: *0
Fire: 0
Reactivity: 0



0 = Minimal Hazard
1 = Slight Hazard
2 = Moderate Hazard
3 = Serious Hazard
4 = Severe Hazard

Personal Protection: Use eye protection. Use gloves and NIOSH/MSHA-approved respiratory protection when required.
*Respirable crystalline silica can cause lung disease and/or cancer.

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 3 HAZARD IDENTIFICATION (continued)

EMERGENCY OVERVIEW

This product is not expected to produce any unusual hazards during normal use. Exposure to high dust levels may irritate the skin, eyes, nose, throat, or upper respiratory tract.

ACUTE:

Eyes: Airborne dust or direct contact can cause mechanical irritation of eyes. If burning, redness, itching, pain or other symptoms persist or develop, consult physician.

Skin: No toxic effects from powdered gypsum are noticed where air contains contaminate to excess. This material exhibits some affinity for moisture, and frequent exposures may have a drying effect on the skin. Possible itching and irritation may be experienced. This may lead to dermatitis. No penetration of intact skin.

Inhalation: Inhalation of dust can irritate the nose, throat, and the upper respiratory tract. Persons subjected to large amounts of this dust will be forced to leave area because of nuisance conditions such as coughing, sneezing and nasal irritation. Labored breathing may occur after excessive inhalation. If respiratory symptoms persist, consult physician.

Ingestion: Unlikely to occur, but may cause gastric disturbances if swallowed. Gypsum is non-toxic; however, ingestion of a sufficient quantity could lead to mechanical obstruction of the gut, especially the pyloric region. See First Aid Measures - Ingestion (Section 4).

CHRONIC:

Inhalation: The concentration of respirable crystalline silica measured in bulk samples of USG gypsum was less than 0.1 Wt.%. Industrial hygiene testing, following the NIOSH Method 7500, did not detect respirable crystalline silica in dust created during the cutting of USG gypsum wallboard panels by both the recommended score and snap technique and with the use of a power saw in a 10ft by 10ft room.

Gypsum wallboard panels do not release respirable dust in their installed state and therefore do not present any known health hazards when installed and properly maintained.

Prolonged and repeated exposure to airborne free respirable crystalline silica can result in lung disease (i.e., silicosis) and/or lung cancer. The development of silicosis may increase the risks of additional health effects. The risk of developing silicosis is dependent upon the exposure intensity and duration. Exposures to respirable crystalline silica are not expected during the normal use of this product; however, actual levels must be determined by workplace hygiene testing.

Eyes: None known.

Skin: Prolonged and repeated exposure may dry skin and possibly lead to dermatitis.

Ingestion: No known effects.

TARGET ORGANS: Eyes, skin and respiratory system.

PRIMARY ROUTES OF ENTRY: Inhalation, eyes and skin contact.

SECTION 4
FIRST AID MEASURES

FIRST AID PROCEDURES

Eyes: Flush thoroughly with water for 15 minutes to remove particles. If irritation persists, consult physician.

Skin: Wash with mild soap and water. A commercially available hand lotion may be used to treat dry skin areas. If skin has become cracked, take appropriate action to prevent infection and promote healing. If irritation persists, consult physician.

Inhalation: Remove to fresh air. Leave the area of dust exposure and remain away until coughing and other symptoms subside. Other measures are usually not necessary, however if conditions warrant, contact physician.

Ingestion: No harmful effects expected. No specific recommendations. Calcium sulfate is nontoxic; however, ingestion of a sufficient quantity could lead to mechanical obstruction of the gut, especially the pyloric region. If gastric disturbance occurs, call physician. Drinking gelatin solutions or large volumes of water may delay setting.

MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED: Pre-existing upper respiratory and lung diseases such as, but not limited to, bronchitis, emphysema and asthma. Pre-existing skin diseases such as, but not limited to, rashes and dermatitis.

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 5
FIRE FIGHTING MEASURES

General Fire Hazards:	Not expected to burn.
Extinguishing Media:	Water or use extinguishing media appropriate for surrounding fire.
Special Fire Fighting Procedures:	Wear appropriate personal protective equipment (See section 8).
Unusual Fire and Explosion Hazards:	None
Hazardous Combustion Products:	Above 1450° C - decomposes to calcium oxide (CaO) and sulfur dioxide (SO_2). Organic material in the panels can produce oxides of carbon.

Flash Point:	None Known	**Auto Ignition:**	Not Applicable
Method Used:	Not Applicable	**Flammability Classification:**	Limited combustible
Upper Flammable Limit (UFL):	Not Applicable		
Lower Flammable Limit (LFL):	Not Applicable	**Rate of Burning:**	Not Applicable

SECTION 6
ACCIDENTAL RELEASE MEASURES

CONTAINMENT:

No special precautions. Wear appropriate personal protection (See Section 8). Collect the material from spillage and if not damaged or containated by foreign material, gypsum panels may be reclaimed. Contain the spill by keeping it dry and away from incompatibles (See Section 10).

CLEAN-UP:

Use normal clean up procedures. Wear appropriate protective equipment. If dry, shovel or sweep up material from spillage and place collected material into a container for recovery or waste disposal. Avoid dust generation. Avoid inhalation of dust and contact with eyes and skin. Maintain proper ventilation. If vacuum is used to collect dust, use an industrial vacuum cleaner with a high efficiency air filter. If sweeping is necessary, use dust suppressant. Do not use compressed air for clean up. These procedures will help minimize potential exposures. If washed down, may plug drains.

DISPOSAL:

Follow all local, state, provincial and federal regulations. Never discharge large releases directly into sewers or surface waters. Trace amounts of residue can be flushed to a drain, using plenty of water.

SECTION 7
HANDLING AND STORAGE

HANDLING:

Avoid dust contact with eyes. Wear the appropriate eye protection against dust (See Section 8).

Avoid breathing dust. Wear the appropriate respiratory protection against dust in poorly ventilated areas and if TLV is exceeded (see Sections 2 and 8).

Minimize dust generation and accumulation. Use good safety and industrial hygiene practices.

When moving board with a forklift or similar equipment, it is essential that the equipment be rated capable of handling the loads. The forks should always be long enough to extend completely through the width of the load. Fork spacing between supports should be one half the length of the panels or base being handled so that a maximum of 4' extends beyond the supports on either end.

Follow traditional building practices; such as management of water away form the interior of the structure to avoid the growth of mold, mildew and fungus. Remove any building products suspected of being exposed to sustained moisture and considered conducive to mold growth from the jobsite.

Gypsum panels are very heavy awkward loads posing the risk of severe back injury. Use proper lifting techniques.

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 7 HANDLING AND STORAGE (continued)

STORAGE:

Store in a cool, dry, ventilated area away from sources of heat, moisture and incompatibilities (see Section 10).

Protect product from physical damage.

Protect from weather and prevent exposure to sustained moisture.

Gypsum Association literature recommends storing board flat to avoid damaging edges, warping the board and the potential safety hazards of the board falling over. However, in other situations, storing the board flat may cause a tripping hazard or exceed floor limit loads. If stacking board vertically, leave at least 4 inches from the wall to decrease the risk of falling board and no more than 6 inches to avoid too much lateral weight against the wall.

SECTION 8
EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS:

Good general ventilation should be sufficient to control airborne dust levels.

If user operations generate airborne dust, use ventilation to keep dust concentrations below permissible exposure limits (See Section 2).

Where general ventilation is inadequate, use process enclosures, local exhaust ventilation, or other engineering controls to control dust levels below permissible exposure limits (see Section 2).

RESPIRATORY PROTECTION:

Wear a NIOSH/MSHA-approved respirator equipped with particulate cartridges when dusty in poorly ventilated areas, and if TLV is exceeded. A respiratory program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant a respirator's use.

OTHER PERSONAL PROTECTIVE EQUIPMENT:

Eye/Face: Wear eye protection (safety glasses or goggles) to avoid particulate irritation of the eye.

Skin: Gloves or protective clothing are usually not necessary but may be desirable in specific work situations. For brief contact, no precautions other than clean body-covering clothing should be needed. Wear gloves [chemical gloves are not necessary, there is no chemical irritation hazard] and protective clothing to prevent repeated or prolonged skin contact. Barrier creams or skin lotion may be applied to face, neck, wrist and hands when skin is exposed to help prevent drying of skin.

General: Selection of Personal Protective Equipment will depend on environmental working conditions and operations.

SECTION 9
PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Paper with gray to off white core	**Odor**	Low to no odor
Physical State	Solid	**pH @ 25 ° C**	~ 7
Vapor Pressure	Not Applicable	**Vapor Density (Air = 1)**	Not Applicable
Boiling Point	Not Applicable	**Vapor Pressure (mm Hg)**	Not Applicable
Freezing Point	Not Applicable	**Evaporation Rate (BuAc = 1)**	Not Applicable
Melting Point	1450° C - decomposes	**Percent Volatile**	0
Softening Point	Not Applicable	**Particle Size**	Not Applicable
Solubility (H2O)	0.26/100g	**Molecular Weight**	~ 172
Viscosity	Not Applicable	**Bulk Density**	~ 55 lb/ft^3

Specific Gravity (H_20 = 1): 2.32 – 2.96

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 10
CHEMICAL STABILITY AND REACTIVITY

STABILITY:	Stable in dry environments.
CONDITIONS TO AVOID:	Contact with incompatibles.
INCOMPATIBILITY:	None known.
HAZARDOUS POLYMERIZATION:	Will not occur.
HAZARDOUS DECOMPOSITION:	Above 1450° C - calcium oxide (CaO) and sulfur dioxide SO_2. Oxides of carbon.

SECTION 11
TOXICOLOGICAL INFORMATION

ACUTE EFFECTS:

Gypsum paste applied experimentally to the eyes of rabbits was not an irritant.

Gypsum dust particulate has shown an irritant action on mucous membranes of the respiratory tract and eyes.

There have been anecdotal reports of conjunctivitis, chronic rhinitis, laryngitis, pharyngitis, impaired sense of smell and taste, bleeding from the nose, and reactions of tracheal and bronchial membranes in exposed workers.

The sulfate ion has caused gastro-intestinal disturbance in humans following large oral doses.

Limited studies involving the repeated inhalation of an (unspecified) calcium sulfate failed to identify any particular target organs in monkeys, rats and hamsters.

No evidence of mutagenicity was found in Ames bacterial tests.

LD_{50}: Not Available for product.

LC_{50}: Not Available for product.

CHRONIC EFFECTS / CARCINOGENICITY:

Crystalline silica: The concentration of respirable crystalline silica measured in bulk samples of USG gypsum was less than 0.1 Wt.%. Industrial hygiene testing, following the NIOSH Method 7500, did not detect respirable crystalline silica in dust created during the cutting of USG gypsum wallboard panels by both the recommended score and snap technique and with the use of a power saw in a 10ft by 10ft room.

Gypsum wallboard panels do not release respirable dust in their installed state and therefore do not present any known health hazards when installed and properly maintained.

Prolonged and repeated exposure to airborne free respirable crystalline silica can result in lung disease (i.e., silicosis) and/or lung cancer. The development of silicosis may increase the risks of additional health effects. The risk of developing silicosis is dependent upon the exposure intensity and duration. Exposures to respirable crystalline silica are not expected during the normal use of this product; however, actual levels must be determined by workplace hygiene testing.

In June, 1997, IARC classified crystalline silica (quartz and cristobalite) as a human carcinogen. In making the overall evaluation, the IARC Working Group noted that carcinogenicity in humans was not detected in all industrial circumstances studied. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs.

IARC states that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1).

SECTION 12
ECOLOGICAL INFORMATION

ENVIRONMENTAL TOXICITY: This product has no known adverse effect on the ecology. A large discharge directly into waterways would not be expected to kill aquatic life.

Ecotoxicity Values: Not determined.

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 13
DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD:
Dispose of material in accordance with Federal, State, Provincial, and Local regulations. Consult with environmental regulatory agencies for guidance on acceptable disposal practices. Never discharge directly into sewers or surface waters.

SECTION 14
TRANSPORT INFORMATION

U.S. DOT INFORMATION: Not a hazardous material per DOT shipping requirements. Not classified or regulated.

Shipping Name	Same as product name.
Hazard Class:	Not classified
UN/NA #:	None. Not classified.
Packing Group:	None.
Label (s) Required:	Not applicable.
GGVSec/MDG-Code:	Not classified.
ICAO/IATA-DGR:	Not applicable.
RID/ADR:	None
ADNR:	None

SECTION 15
REGULATORY INFORMATION

UNITED STATES REGULATIONS

All ingredients of this product are included in the U.S. Environmental Protection Agency's Toxic Substances Control Act Chemical Substance Inventory.

MATERIAL	WT%	302	304	313	CERCLA	CAA Sec. 112	RCRA Code
Gypsum ($CaSO_4 \cdot 2H_2O$)	>80	NL	NL	NL	NL	NL	NL
Cellulose	<15	NL	NL	NL	NL	NL	NL
Parrafin Wax	<2	NL	NL	NL	NL	NL	NL
Crystalline Silica	<1	NL	NL	NL	NL	NL	NL

Key : NL = Not Listed
SARA Title III Section 302 (EPCRA) Extremely Hazardous Substances: Threshold Planning Quantity (TPQ)
SARA Title III Section 304 (EPCRA) Extremely Hazardous Substances: Reportable Quantity (RQ)
SARA Title III Section 313 (EPCRA) Toxic Chemicals: X= Subject to reporting under section 313
CERCLA Hazardous Substances: Reportable Quantity (RQ)
CAA Section 112 (r) Regulated Chemicals for Accidental Release Prevention: Threshold Quantities(TQ)
RCRA Hazardous Waste: RCRA hazardous waste code

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 15 REGULATORY INFORMATION (continued)

CANADIAN REGULATIONS

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations. All components of this product are included in the Canadian Domestic Substances List (DSL).

MATERIAL	WT%	IDL Item #	WHMIS Classification:
Gypsum ($CaSO_4 \cdot 2H_2O$)	>80	Not Listed	Not Listed
Cellulose	<15	Not Listed	Not Listed
Parrafin Wax	<2	Not Listed	Not Listed
Crystalline Silica	<1	1406	D2A

IDL Item # : Canadian Hazardous Products Act – Ingredient Disclosure List Item #
WHMIS Classification: Workplace Hazardous Material Information System

CARCINOGENICITY CLASSIFICATION OF INGREDIENT(S)
All substances listed are associated with the nature of the raw materials used in the manufacture of this product and are not independent components of the product formulation. All substances, if present, are at levels well below regulatory limits. See Section 11 : Toxicology Information for detailed information

MATERIAL	IARC	NTP	ACGIH	CAL- 65
Respirable Crystalline Silica	1	1	A2	Listed

IARC – International Agency for Research on Cancer (World Health Organization)
1- Carcinogenic to humans
2A – Probably carcinogenic to humans
2B – Possibly carcinogenic to humans
3 - Not classifiable as a carcinogen
4 – Probably not a carcinogen

NTP – National Toxicology Program (Health and Human Services Dept., Public Health Service, NIH/NIEHS)
1- Known to be carcinogen
2- Anticipated to be carcinogens

ACGIH – American Conference of Governmental Industrial Hygienists
A1 – Confirmed human carcinogen
A2 – Suspected human carcinogen
A3 – Animal carcinogen
A4 - Not classifiable as a carcinogen
A5 – Not suspected as a human carcinogen

CAL-65 – California Proposition 65 "Chemicals known to the State of California to Cause Cancer"

MATERIAL SAFETY DATA SHEET
FIBEROCK® Brand Gypsum Panels - Aqua Tough

SECTION 16
OTHER INFORMATION

Label Information

ΔWARNING!

Follow good safety and industrial hygiene practices during the handling and installing of all products and systems. Dust created from product may cause eye, skin, nose, throat or upper respiratory irritation. Avoid inhalation of dust and eye contact. Use in a well-ventilated area. Wear a NIOSH/MSHA-approved respirator when dusty. Use proper ventilation to reduce dust exposure. Wear eye protection. If eye contact occurs, flush thoroughly with water for 15 minutes. If irritation persists, call physician. Do not ingest. If ingested, call physician. Panels are heavy and can fall over, causing serious injury or death. Avoid creating a tripping hazard and do not exceed floor limit loads.
Product safety information: (800) 507-8899 or www.usg.com **KEEP OUT OF REACH OF CHILDREN.**

Key/Legend

TLV	Threshold Limit Value
PEL	Permissible Exposure Limit
CAS	Chemical Abstracts Service (Registry Number)
NIOSH	National Institute for Occupational Safety and Health
MSHA	Mine Safety and Health Administration
OSHA	Occupational Health and Safety Administration
ACGIH	American Conference of Governmental Industrial Hygienists
IARC	International Agency for Research on Cancer
DOT	United States Department of Transportation
EPA	United States Environmental Protection Agency
NFPA	National Fire Protection Association
HMIS	Hazardous Materials Identification System
PPE	Personal Protection Equipment
TSCA	Toxic Substances Control Act
DSL	Canadian Domestic Substances List
NDSL	Canadian Non-Domestic Substances List
SARA	Superfund Amendments and Reauthorization Act of 1986
RCRA	Resource Conservation and Recovery Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
UN/NA#	United Nations/North America number
CFR	Code of Federal Regulations
WHMIS	Workplace Hazardous Material Information System

Prepared by:
Product Safety
USG Corporation
125 South Franklin St.
Chicago, Illinois 60606

END

PART 1 - GENERAL

1.1 ENVIRONMENTAL CRITERIA

A. Qualities:
   1. Specify recycled-content material (conserves resources).
   2. Avoid mortars, grout, and adhesives containing petroleum or plastic additives (conserves limited resources, minimizes pollution).

1.2 SUBMITTALS

A. Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Tiles: Architect/Owner will pick max. 1-2 of these types for bathroom floor, and will also select tile for wall, which may be same or different types. Care is to be taken to find compatible thicknesses, edge conditions, shapes/sizes, as well as colors, and especially durability & non-slip textures for floor.
   1. Ceramic-Free Recycled Glass Tile: Minimum 85% post-consumer recycled glass
   2. Glass-Bonded Ceramic Tile: Minimum 55% post-consumer recycled glass
   3. Porcelain Tile: Minimum 70% post-industrial feldspar
   4. Terratile: Site-manufactured material consisting of soil and Portland cement poured in place and stamped with a tile pattern and sealed
   5. Quarry Tile: Minimum 17% post-industrial waste
   6. Stone Tile: Post-industrial waste
   7. Stone Chip Tiles: Stone fragments bound in a Portland cement matrix
B. Latex-Portland cement mortar: Zero-VOC. Recommend thicker bed for floor than wall
C. TEC AccuColor XT grout
D. 1Flex – Crack Isolation Mortar:
E. Tile Adhesive: Water-based, low-VOC (maximum 44 grams/liter)
F. Grout: Cement-based, petroleum- and plastic-free grout
G. Sealants (Low-VOC): Single-component polyurethane sealant: Zero VOC.
H. Virginia Tile Company
   - Saffron – Matte, 5/8” x 5/8” glass tile
I. Crossville
   - Amber Splash 090, 3” x 6”, frosted radiance glass tile

PART 3 - EXECUTION

3.1GROUT INSTALLTION

A. Mixing: For best results, all tiling materials, substrates, room and adhesive should be at 50°-90°F (10-32°C) for 24 hours before and 48 hours after installtion.
   a. 1Flex White: Add 1 gallon of water (3.78 L) to a clean mixing container. Place drill and paddle mixer in the container and add one 35 lb. (15.88 kg) bag of mortar. Mixing works best by adding half of bag, mix, then add additional mortar, mix, etc. Mix material to a thick, creamy consistency. Avoid using high speed mixing (not to exceed 300 rpm) to prevent entraining air. A small amount of additional water may be added to achieve proper consistency, up to 8 oz. (237 ml). Ready to use after mixing.
B. Application: Select a notched trowel size that will provide proper coverage. Apply mortar using flat side of trowel to promote better substrate contact, then comb in one direction with the notched side of the trowel. Spread only an area that can be tiled while surface is still tacky (typically 20-30 minutes). Press tiles into setting bed, then push in a direction perpendicular to the notched trowel ridges to achieve optimum coverage. Apply mortar in a heavy enough layer so that complete contact (no voids) between mortar and tile is accomplished when tile is positioned. It may be necessary to “back-butter” large tiles to achieve complete coverage and firm support. Periodically remove and check a tile to assure proper coverage. Keep a minimum of 2⁄3of the joint depth between tiles for grouting. Open time and tile hand adjustability may vary with job site conditions. Stir occasionally during use to maintain the smooth,

creamy consistency of the product. Do not add additional water.

C. Grouting: Grouting may be accomplished when tiles are held firmly in place, typically 12-16 hours after installation is completed. No traffic is permitted over the tile prior to grouting. Cold temperature or high humidity may extend curing time. The use of TEC brand grouts is highly recommended.
D. Cleaning: Clean tools, hands, and excess materials from face of tile immediately (while mortar is still fresh) with warm soapy water. Material that is cured is difficult or impossible to remove.
E. Limitations:
    a. 1Flex White: Not for installing green marble, other moisture-sensitive stone tile or resin-backed marble; use TEC 100% Solids Epoxy Mortar and Grout.

3.2 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan and place in designated areas in the following categories for recycling:
B. Half tiles and larger: Set aside for reuse by Owner or nonprofit organizations such as Habitat for Humanity
C. Broken tile, cutoffs smaller than 1/2 tile, and excess mortar and grout: Crush for use as mosaic, sub-base, or fill
D. Separate metal waste and place in designated areas for recycling or reuse.
E. Separate cardboard waste and place in designated areas for recycling.

MATERIAL SAFETY DATA SHEET

REVISION DATE: 10-17-2002 SUPERSEDES: None

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
COMPANY INFORMATION
Specialty Construction Brands, Inc.
(formerly TEC Specialty Products, Inc.
An H.B. Fuller Company)
315 South Hicks Road
Palatine, IL 60067
Phone: 847-358-9500

Medical Emergency Phone Number (24 Hours): 1-888-853-1758
Transport Emergency Phone Number (CHEMTREC): 1-800-424-9300
PRODUCT INFORMATION
PRODUCT IDENTIFIER: 816259PM
PRODUCT NUMBER: 1FLEX WHITE
PRODUCT DESCRIPTION: Construction adhesive

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS
Unlisted ingredients are not 'hazardous' per the Occupational Safety and Health Administration Hazard Communication Standard (29 CFR 1910.1200) and/or are not found on the Canadian Workplace Hazardous Materials Information System ingredient disclosure list. See Section 8 for any additional exposure limit guidelines.

Chemical Name	CAS #	PERCENT	OSHA PEL
Crystalline silica	14808-60-7	30 - 50	TWA (Respirable dust) 0.1 MG/M3
Aluminum salts (soluble)	12042-68-1	10 - 30	TWA (as Al) Soluble 2 MG/M3
Aluminum oxide	1344-28-1	1 - 5	TWA (as Al) (Total dust) 10 MG/M3 TWA (as Al) (Respirable dust) 5 MG/M3
Kaolin clay	1332-58-7	1 - 5	TWA (Total dust) 10 MG/M3 TWA (Respirable dust) 5 MG/M3

SECTION 3: HAZARDS IDENTIFICATION
EMERGENCY OVERVIEW

Cancer hazard.

HMIS RATING: HEALTH -- 1 FLAMMABILITY -- 0 REACTIVITY -- 0

See SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for personal protective equipment recommendations.

POTENTIAL HEALTH EFFECTS BY ROUTE OF ENTRY
EYE: No irritation hazard in normal industrial use.
SKIN: No irritation hazard in normal industrial use.

INHALATION: Can cause minor respiratory irritation. Inhalation of dusts produced during cutting, grinding or sanding of this product may cause irritation of the respiratory tract.
Other possible symptoms include coughing or wheezing.
Overexposure to crystalline silica may cause silicosis.
INGESTION: Ingestion is not an anticipated route of exposure.

LONG-TERM (CHRONIC) HEALTH EFFECTS
TARGET ORGAN(S): Lungs

REGULATED CARCINOGEN STATUS:
Unless noted below, this product does not contain regulated levels of NTP, IARC, ACGIH, or OSHA listed carcinogens.

Crystalline silica

EXISTING HEALTH CONDITIONS AFFECTED BY EXPOSURE: Lung disease

SECTION 4: FIRST AID MEASURES
IF IN EYES: Use an eye wash to remove a chemical from your eye regardless of the level of hazard. Flush the affected eye for at least twenty minutes. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Seek medical advice after flushing.
IF ON SKIN: Wash with soap and water. Get medical attention if irritation develops or persists.
IF VAPORS INHALED: Remove to fresh air. Call a physician if symptoms persist.
IF SWALLOWED: No hazard in normal industrial use. Do not induce vomiting. Seek medical attention if symptoms develop. Provide medical care provider with this MSDS.

SECTION 5: FIRE FIGHTING MEASURES
FLASH POINT: Non flammable
AUTOIGNITION TEMPERATURE: Not established
LOWER EXPLOSIVE LIMIT (% in air): Not established
UPPER EXPLOSIVE LIMIT (% in air): Not established
EXTINGUISHING MEDIA: Use water spray, foam, dry chemical or carbon dioxide.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
SPECIAL FIRE FIGHTING INSTRUCTIONS: Persons exposed to products of combustion should wear self- contained breathing apparatus and full protective equipment.
HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, Carbon monoxide Aluminum oxide

SECTION 6: ACCIDENTAL RELEASE MEASURES
SPECIAL PROTECTION: No health effects expected from the cleanup of this material if contact can be avoided. Follow personal protective equipment recommendations found in Section 8 of this MSDS.
CLEAN-UP: Avoid creating dusts. Cover material with absorbent and moisten and collect for disposal.

Transport Emergency Phone Number (CHEMTREC): 1-800-424-9300

SECTION 7: HANDLING AND STORAGE
Handling: Mildly irritating material. Avoid unnecessary exposure. Avoid breathing material.

Storage: Store in a cool, dry place.

Consult the Technical Data Sheet for specific storage instructions.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION
EYE PROTECTION: Wear safety glasses when handling this product.
SKIN PROTECTION: Avoid skin contact by wearing chemically resistant gloves.
GLOVES: Nitrile
RESPIRATORY PROTECTION: Respiratory protection may be required to avoid overexposure when handling this product. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms. NIOSH approved air purifying respirator with dust/mist filter. Respirators should be selected by and used following requirements found in OSHA's respirator standard (29 CFR 1910.134).
VENTILATION: Use local exhaust ventilation or other engineering controls to minimize exposures.
EXPOSURE LIMITS:

Chemical Name	ACGIH EXPOSURE LIMITS	AIHA WEEL
Crystalline silica	TWA (Respirable dust) 0.05 MG/M3	Not established
Aluminum salts (soluble)	TWA (as Al) Soluble 2 MG/M3	Not established
Aluminum oxide	TWA (Total dust) 10 MG/M3	Not established
Kaolin clay	TWA (Respirable dust) 2 MG/M3	Not established

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: Solid
COLOR: White
ODOR: Odorless
ODOR THRESHOLD: Not established
WEIGHT PER GALLON (lbs.): 10.52
SPECIFIC GRAVITY: 1.26
SOLIDS (% by weight): Not applicable
pH: Not established
BOILING POINT (deg. C): Not established
FREEZING/MELTING POINT (deg. C): Not established
VAPOR PRESSURE (mm Hg): Not established
VAPOR DENSITY: Not established
EVAPORATION RATE: Not established
OCTANOL/WATER COEFFICIENT: Not established

SECTION 10: STABILITY AND REACTIVITY
STABILITY: Stable under normal conditions.
CHEMICAL INCOMPATIBILITY: Not established
HAZARDOUS POLYMERIZATION: Will not occur.
HAZARDOUS DECOMPOSITION PRODUCTS: Carbon monoxide, carbon dioxide Aluminum oxide

SECTION 11: TOXICOLOGICAL INFORMATION

CHEMICAL NAME	LD50/LC50
Crystalline silica	Not established
Aluminum salts (soluble)	Not established
Aluminum oxide	Not established
Kaolin clay	Not established

TOXICOLOGY SUMMARY: No additional health information available.

SECTION 12: ECOLOGICAL INFORMATION
OVERVIEW: No ecological information available

SECTION 13: DISPOSAL CONSIDERATIONS
To the best of our knowledge, this product does not meet the definition of hazardous waste under the U.S. EPA Hazardous Waste Regulations 40 CFR 261. Dispose of in an approved landfill. Consult your state, local or provincial authorities and your local waste vendor for more restrictive requirements.

SECTION 14: TRANSPORTATION INFORMATION
Consult Bill of Lading for transportation information.
DOT: NOT REGULATED
IATA: NOT REGULATED

SECTION 15: REGULATORY INFORMATION
INVENTORY STATUS
U.S. EPA TSCA: This product is in compliance with the Toxic Substances Control Act's Inventory requirements.
If you need more information about the inventory status of this product call 651-236-5858.

TSCA Section 12(b) - Export Notice Requirements
This product contains a chemical substance that is currently on the EPA's Section 12(b) Export List. Contact the company Global Regulatory Group at 651/236-5858 for the identity of the Section 12(b) chemical(s).

FEDERAL REPORTING
EPA SARA Title III Section 313
Unless listed below, this product does not contain toxic chemical(s) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) and 40 CFR part 72. EPA has advised that when a percentage range is listed the midpoint may be used to fulfill reporting obligations.

Chemical Name	CAS#	%
	1344-28-1	1 - 5

WHMIS STATUS: Unless listed below, this product is not controlled under the Canadian Workplace Hazardous Materials Information System.

D2A

STATE REPORTING
Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986:
Unless listed below, this product does not contain known levels of any chemical known to the State of California to cause cancer or reproductive harm.

Chemical Name/List	CAS	Percent
Quartz	14808-60-7	30 - 50
Benzene (Carcinogen)	71-43-2	0.01 - 0.1
Acrylamide (Carcinogen)	79-06-1	0.001 - 0.01
Acetaldehyde (Carcinogen)	75-07-0	0.001 - 0.01
Lithium carbonate (Developmental toxin)	554-13-2	0.1 - 1
Benzene (Developmental toxin)	71-43-2	0.01 - 0.1
Toluene (Developmental toxin)	108-88-3	0.01 - 0.1
Benzene (Male reproductive toxin)	71-43-2	0.01 - 0.1

SECTION 16: ADDITIONAL INFORMATION
This Material Safety Data Sheet is prepared to comply with the United States Occupational Safety and Health Administration (OSHA) Hazard Communication Standard (29 CFR 1910.1200) and the Canadian Workplace Hazardous Materials Information System (WHMIS).

Prepared by: The Global Regulatory Department
Phone: 651-236-5842

The information and recommendations set forth herein are believed to be accurate. Because some of the information is derived from information provided to Specialty Construction Brands, Inc. from its suppliers, and because Specialty Construction Brands, Inc. has no control over the conditions of handling and use, Specialty Construction Brands, Inc. makes no warranty, expressed or implied, regarding the accuracy of the data or the results to be obtained from the use thereof. The information is supplied solely for your information and consideration, and Specialty Construction Brands, Inc. assumes no responsibility for use or reliance thereon. It is the responsibility of the user of Specialty Construction Brands, Inc. products to comply with all applicable federal, state and local laws and regulations.

END OF SECTION 09 30 00

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Select FSC-certified wood products (protects habitats, conserve resources).
Select salvaged flooring or flooring manufactured from salvaged wood (conserves resources).
With engineered-wood flooring, select products with thick face veneers that are able to be refinished (conserves resources).
Select nontoxic, low-VOC finishes and adhesives (reduces pollution, improves indoor air quality).

1.2 SUBMITTALS
Provide a cut sheet and material safety data sheet (MSDS) for all coatings applied on-site in the building, with VOC levels highlighted and chemical components listed.

PART 2 - PRODUCTS
2.1 MATERIALS
Solid Wood: Salvaged wood from our house demolition work (red oak) or from trees killed by ash borer beetle if there is insufficient oak to do whole house.
Both to be 3” wide ¾” thick Tongue-and-Groove style.
Substrate: Soft wood 1x3 nailers supporting aluminum fins that wrap PEX tubing of radiant flooring; nailer are supported on SIP floor covered by radiant reflective barrier.
Finish: Avoid finishes containing lead acetate or cobalt manganese drying agents. Architect /owner chooses one from:

- Urethane: Water-based
- Penetrating oils and waxes:
- Polymerized linseed oil
- Polymerized tung oil
- Natural vegetable and nut oils
- Beeswax.
- Adhesives: Water-based, low-VOC

Launstein Harwood Floors (3/8” solid hardwood flooring): Ash-Select:

- Wood is an organic substance composed of microscopic, strawlike fibers called cellulose. Depending on atmospheric conditions, these fibers will either gain or expel moisture, thus affecting the crossgrain dimension of the lumber. To help control this effect, Launstein kiln-dries all of its rough-cut lumber to about 6% moisture content before further manufacturing processes begin. Even then, seasonal changes will continue to vary the wood's moisture content. In the midwest, for example, this can range from 3% in the winter to as high as 15% in the summer months. This constant process of adapting is part of what gives wood its personality--and what makes it so appealing.

PART 3 - EXECUTION
3.1 INSTALLATION

A. For optimum results, Launstein's 3/8" flooring should be installed over a 3/4" plywood (min.) subfloor. Double floor systems of 1/2" and 5/8" plywood or 3/4" tongue and groove decking are also acceptable subflooring. Oriented strand board or particle board subflooring should be first covered with underlayment such as 1/4" lauan or similar plywood.
B. The subfloor must be free from all contaminants such as drywall dust or glue residue from previous floors. Also, it must be 10% moisture content or less.
C. It is possible to install a wood floor over existing vinyl or tile floors under certain conditions. The old flooring can be no more than 1/8" thick and must be securely bonded to a plywood subfloor. To test the bond, use a suitable construction adhesive to glue a new plank to the old floor. Wait at least 48 hours, then remove. It should be fairly difficult to remove and there should be near even distribution of glue residue on both the floor and the board.
D. Acclimate flooring material by stacking the bundles in the area of installation in a way that they will be protected from draft and moisture.
E. Surface must be clean and dry.
F. Begin by undercutting all door casings, jambs, etc. for the new planks to fit under. A short length of

planking can serve as a marking guide for cutting.

G. When possible, start the installation along the longest outside wall. If measuring proves the room to be unsquare, as most are, you will need to adjust accordingly and snap a chalkline near the wall. This line will serve as a straight guide for the first row of planks.
H. Select a few starter planks that perfectly straight. Apply a 1/4" wide bead of our recommended construction adhesive in a running "S" pattern along the full length of the underside of the plank. With the chalkline as your reference, place the first board *with the groove edge toward the wall.* Be sure to leave 1/8" to 1/4" space against all walls. This gap will later be covered by base or shoe molding.
I. Nail the groove edge to the subfloor with the pneumatic pin nailer, being sure to keep downward pressure on the plank with your free hand as you work. Nail should be spaced about every three to four inches. *(NOTE: Only the starter row is nailed along the groove edge.)* Finish installing the first row in this manner, making sure that the end joints are fully seated as you progress.
J. Now hold the nailer at a 45 degree angle so that the tip rests firmly in the trough created by the tongue and the upper edge of the plank. (see photo) Nail the full length of the row through the tongue at this angle, placing nails every three to four inches apart.
K. When the first row is complete, select planks for the second row. Here, and as you work your way across the room, stagger the end joints as much as possible so they will be evenly distributed throughout the finished floor. The varying lengths supplied in each bundle will simplify this
L. Glue the boards of the second row and set them with the groove edge along the previously nailed tongue edge.
M. Tap each new board into place with a hammer and block of wood so that the tongue and groove edges are snug. (Note: Never strike the plank directly with the hammer as this can damage the tongue)
N. Continue installing each new row. Glue, tap snug, nail tongued edge every three to four inches. In some cases, such as bay window or closet areas, it may be necessary to reverse directions or back-fill an area. In that case you will be installing a groove against a groove and will need to use a spline. Glue the spline into the groove, this will transform the groove into a tongue. You can then continue installing as usual.
O. To apply polyurethane, pour the material into a paint pan, then spread it onto the floor with a paint pad using a mopping motion. If the dried finish seems rough, it can be lightly sanded between the first and second coats.

3.2 FINISHING

A. Launstein's 3/8" flooring comes pre-sanded and is suitable for finishing right out of the package. If desired, a finer finish can be achieved by using an oscillating sander or drywall pad.
B. Thoroughly vacuum dust from the floor and baseboards. Allow dust in the air to settle, then revacuum. A tack cloth can also be used. If a stained finish is desired, apply at this time according to the manufacturer's directions.

3.3 PROTECTION

A. Protectors for chair legs are highly recommended to help prevent marring the finish. Always use caution when moving furniture or appliances over your new floor.

3.4 WASTE MANAGEMENT

A. Separate and recycle waste materials in accordance with the Waste Management Plan and to the maximum extent economically feasible.
B. Set aside and protect offcuts and remainders greater than 2 linear feet for reuse. Separate clean, unfinished wood at end of installation for reuse or remanufacturing.
C. Separate smaller offcuts and clean sawdust for composting or kindling.
D. Fold up metal banding; flatten and place in designated area for recycling.
E. Collect wood packing shims and pallets; place in designated area.

END OF SECTION 09 64 00

PART 1 – GENERAL

1.1 SUMMARY

A. Richlite is made up of layers of paper and phenolic resin, wood pulp, Hemp from Abaca fibers
B. Richlite products will be used on countertops, etc. on interior.
C. Skatelite is to be used on the exterior.

PART 2 – PRODUCTS

2.1 SPECIFICATIONS

A. Thicknesses: ¾”, 1”, 1 ¼”, 1 ½”, 2”, 2 ½”: ¾” min thickness for countertop use.
B. Colors: RS 3000 Slate Black
C. Heat resistant up to 350 degrees Fahrenheit
D. Cantilevers and spans:
    a. ¾” will remain stable with a 12” overhand
    b. 1” will remain stable with a 1” overhang
    c. 1 ½” will remain stable with a 24” overhang
E. Tensile Strength:
    a. X direction: 19,200 psi
    b. Y direction: 13,100 psi
F. Compressive Strength:
    a. X direction: 18,400 psi
    b. Y direction: 15,900 psi

2.2 PRODUCTS

A. Equipment:
    a. Saw blades: jigsaw blades for curves
    b. Routers with a 3 ¼ horse power minimum
    c. Clamps
    d. Drill, bi-metal hole sax or carbide-tipped hol saw for larger wholes
    e. Biscuit cutter: DW 375-5 minimum power – 6.5 amps
    f. Sanders
    g. Supplies

2.3 WARRANTY

A. ¼” and ½” not covered under warranty
B. Limited Product Warranty for Counters offered only through Richlite Certified fabricatos.

PART 3 – EXECUTION

3.1 CARE AND MAINTENANCE

A. Wiping down surface with hot soapy water or a mild abrasive kitchen cleaner
B. Use hot pads or trivets under hot pots and pans.
C. Always use a cutting board.
D. Never use chemicals to clean or refinish Richlite and Skatelite products
E. To remove stains and light scratches, use a maroon or green Scotch Brite pad with light buffing.
F. If harsh scratches or burn marks accrue, we recommend the use of a maroon Scotch Brite or 220 grit or above sand paper on a random orbital sander to remove. Excessive sanding in the same area may result in light spots, refinishing of the whole area may be needed to keep a consistent look across the entire surface.
G. After buffing the surface with the Scotch Brite pad wipe down surface with damp cloth to remove all particles. Apply a thin coat of the Richlite and/or Skatelite finish to the portion of countertop you are treating, spread with bare hands over the entire surface. Let finish set for a minimum of 20 minutes and wipe off excess. Finish using a clean, soft cloth to give an even, rich luster. For best results, do not use finished area for at least 12 hours so the finish can harden. Then wipe down with a soft cloth and buff until desired look is achieved.

3.2 FABRICATION AND FINISH INSTRUCTIONS

A. Do:
   1. Follow manufacturer's installation instructions and guidelines.
   2. Always work in a well-ventilated area, using eye and ear protection, and wearing a dust mask.
   3. Increase cutting rate if you detect excess heat.
   4. Fully support the Richlite and Skatelite slabs at all times during the cutting process to eliminate the opportunity for the blade to bind due to a shift in weight.
   5. When shaping Richlite and Skatelite with a router, use carbide bits.
   6. Plan accordingly to maintain cutting pace when cutting tight spots such as an inside corner.
   7. We suggest a few practice runs on a piece of scrap material.
   8. Coarse shavings indicate proper cutting rate.
   9. Wood screws provide tremendous fastening strength. Pilot holes must be drilled that are slightly larger than the shaft of the screw and not larger than the outside edge of the screw. Insert screws slowly to ensure that they don't snap or overheat. Screw heads may become hot immediately after insertion. Exercise caution when touching them.
   10. Richlite and Skatelite can also be tapped to accommodate threaded fasteners or threaded inserts.
   11. Fasteners may be press-fit or cast in place with an epoxy compound.

B. SEAMING AND BONDING
   1. Please note color and sheet thickness may vary from sheet to sheet. It is very important to have the top even due to the fact that Richlite and Skatelite is bonded layers of paper. Like a wood veneer, excessive sanding in one area can leave a ghost like line as a result of sanding through the top layer.
   2. Richlite and Skatelite seams may be visible and should be considered in the design process. Plan seams away from sink cutouts and cook top cutouts.
   3. Seams should run the entire depth of a counter to be structurally sound.
   4. Seams may be place either diagonally from the corner or at a 90 degree angle, perpendicular to corner.

C. SANDING AND FINISHING
   1. Use an orbital sander with 150 grit sandpaper.
   2. Do not sand too aggressively
   3. Sand lightly around uneven surface ares.
   4. It is recommended to leave some of the mill finish visible because it hides general wear and tear and scratches.

MATERIAL SAFETY DATA SHEET

MSDS Name: GEL#2
MSDS Number: V-100
Version Number
MSDS Date: APR-30-2004
Page Number: 1 of 8

SECTION I - PRODUCT AND COMPANY INFORMATION

AKA Richlite Seal

Product Name:	GEL#2
CAS Number	MIXTURE
Hazard Rating:	Health: 2 Fire: 2 Reactivity: 0 PPI: H
Company Identification:	COATING DEVELOPMENT GROUP, INC P.O. BOX 14817 SCHILLER & ALLEN STREETS PHILADELPHIA PA 19134-4817
Contact:	MICHAEL A. BARNISIN
Telephone/Fax:	(215) 426-6216 (215) 426-6219
Emergency Phone (24 Hour):	MICHAEL A. BARNISIN (610) 369-7988
Preparer	MARK R. KOCHANOWICZ COATINGS TECHNOLOGIST
Product Class	TOPCOATS
Trade Name	
Product Code	V-100

SECTION II - INGREDIENT AND HAZARD INFORMATION

Ingredient Name	CAS Number	Percent
MINERAL SPIRITS	8052-41-3	43.97
HMIS Health: 1 Fire:2 Reactivity:0 PPI:H____		
HYDROTREATED KEROSENE	64742-47-8	8.25
HMIS Health: 1 Fire:2 Reactivity:0 PPI:H____		
KEROSENE	8008-20-6	6.75
HMIS Health: 1 Fire:2 Reactivity:0 PPI:H____		
PSEUDOCUMENE	95-63-6	0.79
HMIS Health: 2 Fire:2 Reactivity:0 PPI:H____		
XYLENE	1330-20-7	0.59
HMIS Health: 2 Fire:3 Reactivity:0 PPI:H____		

MATERIAL SAFETY DATA SHEET

MSDS Name: GEL#2
MSDS Number: V-100
Version Number
MSDS Date: APR-30-2004
Page Number: 2 of 8

MANGANESE COMPOUNDS	15339-36-3	0.23
HMIS Health: 2 Fire:2 Reactivity:0 PPI:H____		
COLBALT COMPOUNDS	COMPOUND	0.22
HMIS Health: 2 Fire:0 Reactivity:0 PPI:H____		
METHYLETHYL KETOXIME (MEKO)	96-29-7	0.19
HMIS Health: 2 Fire:2 Reactivity:0 PPI:H____		
ETHYLBENZENE	100-41-4	0.14
HMIS Health: 2 Fire:3 Reactivity:0 PPI:H____		

*** ALL Ingredients in this product are listed in the T.S.C.A. Inventory

SECTION III - HAZARDS IDENTIFICATION

EYE CONTACT - Exposure may cause eye irritation. Symptoms may include stinging, tearing and redness.

INGESTION - Harmful or fatal if swallowed. Pulmonary aspiration hazard if swallowed and/or vomiting occurs - can enter lungs and cause damage.

INHALATION - Excessive exposures may cause irritation to eyes, nose, throat, lungs; respiratory tract; central nervous system (brain) effects; headaches, nausea; dizziness, loss of balance and coordination; unconsciousness, coma; respiratory failure and death. Repeated excessive exposures may cause liver effects or damage; kidney effects or damage.

SKIN - Skin absorption of material may produce systemic toxicity. May cause irritation with prolonged or repeated contact. Removes natural oil and fats from skin.

CANCER HAZARDS
CONTAINS COBALT - Cobalt and its compounds are confirmed animal carcinogens and are suspected human carcinogens.

CONTAINS ETHYLBENZENE - The International Agency for Research on Cancer (IARC) has listed ethylbenzene as a possible cancer causing agent to animals.

Prolonged or repeated overexposure to ethylbenzene may cause the

---

---

following: - kidney effects - liver effects - lung effects - pituitary effects - thyroid effects - testicular effects.

CONTAINS METHYLETHYL KETOXIME (MEKO) - WARNING -Causes severe eye irratation and may cause eye damage. May cause skin sensitization. Harmful if inhaled. May be harmful if swallowed or absorbed through the skin. May inhibit alcohol metabolism. Chronic inhalation toxicity studies in animals indicate MEKO has the potential to cause methemoglobin, cataract formation and histopathological changes in the upper respiratory tract. A rodent liver carcinogen; relevance to humans is questionable.

SECTION IV - FIRST AID MEASURES

EYE CONTACT - Flush immediately with large amounts of water for at least 15 minutes. Take to a physician for medical treatment.

INGESTION - DO NOT INDUCE VOMITING! This material is an aspiration hazard. If individual is drowsy or unconscious, place on left side with head down. Seek medical attention. If possible, do not leave individual unattended.

INHALATION - Remove to fresh air. Restore breathing. Treat symptomatically. Consult a physician.

SKIN CONTACT - Wash affected areas with soap and water. Remove contaminated clothing and shoes. Obtain medical attention if irritation persists. Do not reuse contaminated clothing without laundering. Destroy or thoroughly clean shoes before reuse.

SECTION V - FIRE-FIGHTING MEASURES

Flammability Class	II
Flash Range:	100.oF (37.78oC)
Explosive Range:	Not Available

Use foam, carbon dioxide (CO2) or dry chemical. Water may not be effective to extinguish fire. Use water spray to cool fire-exposed containers and to protect personnel.

Keep personnel removed from and upwind of fire. Wear full

---

fire-fighting turn-out gear (full bunker gear), and respiratory protection (SCBA). Cool container with water spray.

SECTION VI - ACCIDENTAL RELEASE MEASURES

Contain spilled liquid with sand or earth. DO NOT use combustible materials, such as sawdust.

Eliminate all ignition sources, use explosion-proof equipment. The very fine particles can cause fire or explosion. Vacuum or sweep material and place in a disposal container. Obey all local, state and federal laws regarding chemical spills.

SECTION VII - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN - Closed containers may explode when exposed to extreme heat. Store away from high temperatures, sparks and flames. Avoid prolonged skin contact. Do not breath spray mist. Ground containers while pouring and limit free fall to a few inches to prevent static sparks. Avoid spontaneous combustion of contaminated rags and other easily ignitable organic accumalations (such as spray booth residues) by immediate immersion in water. Emptied containers may retain hazardous properties. Do not cut, puncture or weld on or near the container. Store large quantities only in buildings designed to comply with OSHA 1910.106.

SECTION VIII - EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

	ACGIH TLV	ACGIH TLV-C	ACGIH STEL	OSHA STEL	OSHA PEL
MINERAL SPIRITS	100.00 PPM	N/est	N/est	N/est	100.00 PPM
HYDROTREATED KEROSENE	N/est	N/est	N/est	N/est	N/est
KEROSENE	N/est	N/est	N/est	N/est	N/est
PSEUDOCUMENE					

MATERIAL SAFETY DATA SHEET

MSDS Name: GEL#2
MSDS Number: V-100
Version Number
MSDS Date: APR-30-2004
Page Number: 5 of 8

	25.00 PPM	N/est	N/est	N/est	N/est
XYLENE	100.00 PPM	N/est	N/est	N/est	100.00 PPM
MANGANESE COMPOUNDS	N/est	N/est	N/est	N/est	N/est
COLBALT COMPOUNDS	0.02 mg/M3	N/est	N/est	N/est	0.05 mg/M3
METHYLETHYL KETOXIME (MEKO)	N/est	N/est	N/est	N/est	N/est
ETHYLBENZENE	100.00 PPM	N/est	125.00 PPM	125.00 PPM	100.00 PPM

RESPIRATORY PROTECTION - Provide adequate ventilation. If TLV of the product is exceded, a NIOSH/MSHA jointly approved self-contained breathing apparatus with a full facepiece operated in pressure demand or other positive pressure mode is advised.

VENTILATION - Provide sufficient mechanical and/or local exhaust ventilation to maintain exposure below TLV.

PROTECTIVE GLOVES - Wear resistant gloves such as Buna-N (nitrile rubber).

EYE PROTECTION - Chemical splash goggles in compliance with OSHA regulations are advised.

OTHER PROTECTIVE EQUIPMENT - To prevent prolonged skin contact, wear impervious clothing and boots. Maintain an eyewash facility and an emergency shower.

SECTION IX - PHYSICAL AND CHEMICAL PROPERTIES

Form:	LIQUID GEL
Appearance/Color:	AMBER
Odor:	PETROLEUM DISTILLATE
Solubility (in water):	INSOLUBLE
pH Value:	Not Available
Boiling Range:	277.oF - 617.oF (136.11oC - 325.oC)

MATERIAL SAFETY DATA SHEET

MSDS Name: GEL#2
MSDS Number: V-100
Version Number
MSDS Date: APR-30-2004
Page Number: 6 of 8

Vapor Pressure (mmHg):	Not Available
Melting Point:	Not Available
Evaporation Rate:	0.07 times Slower than n-Butyl Acetate
Vapor Density:	Heavier than air
Partition Coefficient	Not Available
% Volatile Weight	60.83%
% Volatile	BY VOLUME 67.46%
Specific Gravity:	0.87348
VOC	1.55 VOC/NV LBS
Molecular Weight:	N/A
Heavy Elements (ppm)	0.

SECTION X - STABILITY AND REACTIVITY

Stability:	This product is stable
Hazardous Polymerization:	Hazardous polymerization will not occur

SECTION XI - TOXICOLOGICAL INFORMATION

Route	Species	Exposure and Dose
PSEUDOCUMENE		
Inhalation	Rat, adult	LC50 18. PPM
Oral	Rat, adult	LD50 5. PPM
ETHYLBENZENE		
Oral	Rat, adult	LD50 3500. PPM

THIS PRODUCT CONTAINS ETHYLBENZENE.
A study conducted by the National Toxicology Program states that lifetime inhalation exposure of rats and mice to high concentrations of ethylbenzene (750 ppm) resulted in increases in certain types of cancer, including kidney tumors in rats and lung and liver tumors in mice. Incidences of testicular adenoma were increased along with increased incidences of thyroid effects in rats at 750 ppm; pituitary effects were observed in female mice at 250 ppm. These effects were not observed in animals exposed to lower concentrations of ethylbenzene (75 ppm). The study does not address the relevance of these results to humans.

SECTION XII - ECOLOGICAL INFORMATION

No data available.

SECTION XIII - DISPOSAL CONSIDERATIONS

Empty containers should be washed and discarded.

Empty containers should not be used for other purposes. Disposal should be in accordance with local, state or national legislation.

SECTION XIV - TRANSPORT INFORMATION

UN Number	NA1993
UN Pack Group	3
UN Class	III
Emergency Storage	N/A
MFAG Table Number	N/A
Kemmler Code	N/A
ICAO/IATA Class	N/A
IMDG Class	N/A
Shipping Name	COMBUSTIBLE LIQUIDS, N.O.S. (MINERAL SPIRITS)
DOT Hazard Class	
Technical Name	

SECTION XV - REGULATORY INFORMATION

SARA TITLE III SECTION 313:
This product contains the following toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right to Know Act of 1986 and of 40 CFR 372:

Ingredient Name	CAS Number	Percent
PSEUDOCUMENE	95-63-6	0.79
XYLENE	1330-20-7	0.59
MANGANESE COMPOUNDS	15339-36-3	0.23

MATERIAL SAFETY DATA SHEET

MSDS Name: GEL#2
MSDS Number: V-100
Version Number
MSDS Date: APR-30-2004
Page Number: 8 of 8

COLBALT COMPOUNDS	COMPOUND	0.22
ETHYLBENZENE	100-41-4	0.14

-PROP 65 (CARCINOGEN)
WARNING: This product contains a chemical known to the state of California to cause cancer.

Ingredient Name	CAS Number	Percent
COLBALT COMPOUNDS	COMPOUND	0.22

SECTION XVI - OTHER INFORMATION

NOTICE - Reports have associated repeated and prolonged occupational exposures with permanent brain and nervous system damage. Intentional misuse by deliberately concentrating and inhaling the contents may be harmful or fatal.

DISCLAIMER:
The information contained herein applies only to the material identified on this MSDS. The data presented in these sheets are based on information provided by the suppliers of the raw materials and chemicals used in the manufacture of this product and is accurate to the best of our knowledge at the date of issue of this MSDS. Coating Development Group, Inc. makes no warranty with respect to the accuracy of the information provided by its suppliers and disclaims all liability of reliance thereon. Coating Development Group, Inc. warrants only that its products conform to their published specifications. We do not guarantee favorable results and we assume no liability in connection with the use of this product. Final determination of the use of this product is the sole responsibility of the user. Although certain hazards are described herein, it cannot be guaranteed that these are the only hazards that exist. All chemicals may present unknown health hazards and should be used with caution. Read all labels.

PART 1 – GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Select low-VOC products (improves indoor air quality).
B. Select durable products (conserves resources).
C. Select least toxic alternative (improves indoor air quality, reduces pollution).
D. Select recycled-content product (conserves resources).
E. Select products made from natural, renewable resources (conserves limited resources).

1.2 SUBMITTALS

A. Product Data:
B. Submit a complete list of paint materials proposed for use, together with manufacturer's technical information, including paint label analysis, VOC content, and Material Safety Data Sheets (MSDS).
C. Submit test results certifying that recycled paint does not contain lead.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Opaque Paints: Architect / Owner to specify appropriate paints or stains for the substrate, room activites, and desired appearance for each substrate needing a painted finish, choosing from the types below:
   1. Waterborne Latex (Acrylic) Emulsion Paint:
   2. Zero-VOC paint: Flat and eggshell, VOC content less than 5 grams/liter
   3. Low-VOC paint: Semi-gloss and gloss, VOC content less than 100 grams/liter
   4. Oil-Based Paint: Low-VOC paint (maximum VOC content: 380 grams/liter); maximum 10% aromatic hydrocarbons content [For increased resistance to yellowing, specify high quality, soy-based oil paints.]
   5. Recycled Paint: Filtered, reblended paint for exterior use; minimum 90% post-consumer recycled content, 50% for lighter colors (Colors may not be consistent). Follow installation instructions that match the type of paint, latex or oil-based.
   6. Low-Biocide Paint: For interior use, formaldehyde-free; free of fungicides or bactericides classified as mercury acetates, phenol phenates, or phenol formaldehyde [Reduced shelf life. Paints are made to order; lead-time may be 1 to 2 months.]
   7. Natural Plant- and Mineral-Based Finishes: Extracts from plants and minimally processed earth minerals, such as chalk or iron oxide; free from petroleum distillates. Solvents include citrus oils and small amounts of low-odor petroleum solvents (de-aromatized isoparaffinics); may contain natural VOCs.
   8. Milk-Based Paint: For interior use only; not suitable for damp conditions; contains lime, milk protein, clay, and earth pigments
   9. Epoxy: Waterborne epoxy; maximum VOC content: 200 grams/liter. Extremely durable, suitable for floors.
B. Transparent Finishes: Pigments provide some UV Protection.
   1. Polyurethane, water-based: Maximum VOC content: 170 grams/liter
   2. Penetrating oil: Oil-based, water-reducible exterior finish
   3. Natural plant-based oils and waxes: Extracts from plants and minimally processed earth minerals, such as chalk or iron oxide, free from petroleum distillates. Solvents include citrus oils and small amounts of low-odor petroleum solvents (de-aromatized isoparaffinics); may contain natural VOCs.
   4. Polymerized linseed oil: Interior use
   5. Polymerized tung oil: Interior Use
C. Paint Strippers - Low-Emitting: Shall not contain methylene chloride. Avoid products containing methanol and trichloroethane.
D. Pigments: To be selected / blended from the following by the Owner/ Architect:
   1. Clay- and mineral-based pigments:
   2. Native earths: Ochre, raw umber, raw sienna
   3. Calcined earths: Burnt umber, burnt sienna
   4. Iron oxides: Mars black, Mars yellow, Mars violet

5. Conventional pigments: Avoid or minimize by avoiding heavily tinted paints. Pigments used in conventional paints contain the following toxic compounds:
6. White: Antimony oxide, rutile titanium dioxide
7. Yellow-orange-red: Cadmium, cadmium lithopone, chrome yellow, molybdate orange, strontium chromate, zinc chromate
8. Blue: Phthalocyanine blue
9. Green: Chrome green, chromium oxide, hydrated chromium oxide, phthalocyanine green

Biocides: Maximum 0.025% allowed

2.2 PAINT

A. Sherwin Williams - Harmony interior latex semi-gloss B10 series
   1. Color: Most Colors, Coverage: 350-400 sq ft/gal @ 4 mils wet; 1.6 mils dry, Drying Time, @ 77°F, 50% RH: temperature and humidity dependent, Touch: 1 hour, Recoat: 4 hours, Flash Point: N/A, Finish: 35 - 45 units @ 60°, Tinting with Blend-A-Color:, Base oz/gal Strength, Extra White 0-5 100%Deep Base 4-12 100%, Addition of Blend-A-Color Tinting Color may increase the VOC, Vehicle Type: Styrenated Acrylic/EVA, B10W951, VOC (EPA Method 24): 0 g/L; 0.0 lb/gal, Volume Solids: 40 ± 2%, Weight Solids: 48 ± 2%, Weight per Gallon: 9.8 lb
   2. SCAQMD, CARB and OTC Compliant
   3. * Anti-microbial - This product contains agents which inhibit the growth of microbes on the surface of this paint film.

2.3 SPECIFICATIONS:

A. Block
   1. 1 ct. Loxon Block Surfacer*
   2. 2 cts. Harmony Interior Latex Semi- Gloss
B. Drywall
   1. 1 ct. Harmony Interior Latex Primer
   2. 2 cts. Harmony Interior Latex Semi- Gloss
C. Masonry
   1. 1 ct. PrepRite Masonry Primer* or Harmony Interior Latex Primer
   2. 2 cts. Harmony Interior Latex Semi- Gloss
D. Plaster
   1. 1 ct. PrepRite Masonry Primer* or Harmony Interior Latex Primer
   2. 2 cts. Harmony Interior Latex Semi- Gloss
E. Wood, Composition Board
   1. 1 ct. PrepRite Classic Interior Latex Primer* or Harmony Interior Latex Primer
   2. 2 cts. Harmony Interior Latex Semi- Gloss
F. * These primers contain relatively low amounts of VOCs, but could result in minor, noticeable odors.

2.4 STANDARDS

A. Harmony® Coatings meet or exceed the criteria set forth by the U. S. Green Building Council LEED-CI, Version 2.0 and LEED-NC Version 2.2. All results have been verified by our ISO 9001 Laboratory.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Test existing finishes for lead before sanding, scraping, or removing. If lead is present, conform to procedures applicable when hazardous or contaminated materials are discovered.
B. Substrate: Install formaldehyde-free MDF, particleboard, or straw particleboard.
C. Drywall
   1. Fill cracks and holes with patching paste/ spackle and sand smooth. Joint compounds must be cured and sanded smooth. Remove all sanding dust.
D. Masonry, Concrete, Cement, Block
   1. All new surfaces must be cured according to the supplier’s recommendations— usually about 30 days. Remove all form release and curing agents. Rough surfaces can be filled to provide a smooth

surface. If painting cannot wait 30 days, allow the surface to cure 7 days and prime the surface with PrepRite® Masonry Primer.

E. Plaster
   1. Bare plaster must be cured and hard. Textured, soft, porous, or powdery plaster should be treated with a solution of 1 pint household vinegar to 1 gallon of water. Repeat until the surface is hard, rinse with clear water and allow to dry.
F. Wood
   1. Sand any exposed wood to a fresh surface. Patch all holes and imperfections with a wood filler or putty and sand smooth.
G. Mildew
   1. Remove before painting by washing with ProClean Professional Mildew Eliminator or a solution of 1 part liquid bleach and 3 parts water. Apply the solution and scrub the mildewed area. Allow the solution to remain on the surface for 10 minutes. Rinse thoroughly with water and allow the surface to dry before painting. Wear protective eyewear, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
H. Caulking
   1. Gaps between walls, ceilings, crown moldings, and other interior trim can be filled with the appropriate Pro Select® caulk after priming the surface

3.2 APPLICATION

A. Application varies by type of paint/ stain and type of substrate:
   1. Low-Biocide Paint: Reduced shelf life. Products should be carefully evaluated for spoilage before applying. Comply with manufacturer's recommendations for storage and application.
   2. Natural Plant- and Mineral-Based Finishes: Products may not perform or behave the same as conventional paints. Comply with manufacturer's recommendations for application.
   3. Milk-Based Paint (Casein): Available in powdered form; add water and stir well. Transparency is controlled by amount of water. In powder form it has an indefinite shelf life. After mixing, do not keep beyond recommended shelf life (to avoid spoilage).
B. Paint Strippers: Compounds that do not contain methylene chloride tend to be slower-acting than conventional paint strippers and may take from one hour to overnight to work. Comply with manufacturer's recommendations for application.
C. Heat Guns: Do not use with lead-based paints.
D. Apply at temperatures above 50°F. No reduction necessary.
   1. Brush—Use a nylon/polyester brush.
   2. Roller—Use a 3/8" - 3/4" nap synthetic roller cover.
   3. Spray—Airless
      a. Pressure ..... 2000 psi
      b. Tip ..... .013"-.017"

3.3 INDOOR AIR QUALITY (IAQ):

A. Wear protective clothing and respirators when applying oil-based paints or using spray equipment with any paints.
B. Maximize ventilation during application and drying.
C. Isolate area of application from rest of building.
D. Vacate space for as long as possible after application. Wait a minimum of 48 hours before occupying freshly painted rooms.
E. Removing or reducing odor does not necessarily reduce toxins and may only serve to reduce natural warning systems to toxins.
F. Plant-based paint products are not necessarily better for IAQ.
G. Avoid paints containing formaldehyde, halogenated solvents, aromatic hydrocarbons, mercury, or mercury compounds. Avoid lead acetate or cobalt manganese (drying agents).

3.4 CLEANUP INFORMATION:

A. Clean spills, spatters, hands and tools immediately after use with soap and warm water. After cleaning, flush spray equipment with mineral spirits to prevent rusting of the equipment. Follow manufacturer's safety recommendations when using mineral spirits.

3.5 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan. Set aside extra paint for future color matches, or reuse by Owner, school theater set designers, Habitat for Humanity, etc. Where local options exist for leftover paint recycling, collect all waste paint by type and provide for delivery to recycling or collection facility.
B. Close and tightly seal all partly used paint and finish containers and store protected in well-ventilated, fire-safe area at moderate temperature.
C. Place empty containers of solvent-based paints in areas designated for hazardous materials.
D. Do not dispose of paints or solvents by pouring on the ground. Place in designated containers for proper disposal.

3.6 WARNINGS AND CAUTIONS:

A. Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.
B. Remove all surface contamination by washing with ProClean Professional® Prep Wash Concentrated Cleaner or other appropriate cleaner, rinse thoroughly and allow to dry. Scrape and sand peeled or checked paint to a sound surface. Sand glossy surfaces dull. Seal stains from water, smoke, ink, pencil, grease, etc. with PrepRite® ProBlock® Primer Sealer.
C. For interior use only.
D. Protect from freezing.
E. Non-photochemically reactive.
F. Use only with adequate ventilation. To avoid overexposure, open windows and doors or use other means to ensure fresh air entry during application and drying. If you experience eye watering, headaches, or dizziness, increase fresh air, or wear respiratory protection (NIOSH approved) or leave the area. Avoid contact with eyes and skin. Wash hands after using. Keep container closed when not in use. Do not transfer contents to other containers for storage.
G. FIRST AID: In case of eye contact, flush thoroughly with large amounts of water. Get medical attention if irritation persists. If swallowed, call Poison Control Center, hospital emergency room, or physician immediately.
H. WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.
I. DO NOT TAKE INTERNALLY. KEEP OUT OF THE REACH OF CHILDREN.

MATERIAL SAFETY DATA SHEET

B10W951
09 00

==========

Section 1 -- PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NUMBER

B10W951

HMIS CODES	
Health	1
Flammability	0
Reactivity	0

PRODUCT NAME
HARMONY* Interior Semi-Gloss Finish, Extra White

MANUFACTURER'S NAME
THE SHERWIN-WILLIAMS COMPANY
101 Prospect Avenue N.W.
Cleveland, OH 44115

EMERGENCY TELEPHONE NO.
(216) 566-2917

DATE OF PREPARATION
07-JAN-07

INFORMATION TELEPHONE NO.
(216) 566-2902

==========

Section 2 -- COMPOSITION/INFORMATION ON INGREDIENTS

% by WT	CAS No.	INGREDIENT	UNITS	VAPOR PRESSURE
0.1	13463-41-7	Zinc Pyrithione		
		ACGIH TLV	Not Available	
		OSHA PEL	Not Available	
15	13463-67-7	Titanium Dioxide		
		ACGIH TLV	10 mg/m3 as Dust	
		OSHA PEL	10 mg/m3 Total Dust	
		OSHA PEL	5 mg/m3 Respirable Fraction	

==========

Section 3 -- HAZARDS IDENTIFICATION

ROUTES OF EXPOSURE
INHALATION of vapor or spray mist.
EYE or SKIN contact with the product, vapor or spray mist.

EFFECTS OF OVEREXPOSURE
EYES: Irritation.
SKIN: Prolonged or repeated exposure may cause irritation.
INHALATION: Irritation of the upper respiratory system.

SIGNS AND SYMPTOMS OF OVEREXPOSURE
Redness and itching or burning sensation may indicate eye or excessive skin exposure.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE
None generally recognized.

CANCER INFORMATION
For complete discussion of toxicology data refer to Section 11.

Continued on page 2

Section 4 -- FIRST AID MEASURES

EYES: Flush eyes with large amounts of water for 15 minutes. Get medical attention.
SKIN: Wash affected area thoroughly with soap and water.
INHALATION: If affected, remove from exposure. Restore breathing. Keep warm and quiet.
INGESTION: Do not induce vomiting. Get medical attention immediately.

Section 5 -- FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL
Not Applicable	N.A.	N.A.

FLAMMABILITY CLASSIFICATION
Not Applicable

EXTINGUISHING MEDIA
Carbon Dioxide, Dry Chemical, Alcohol Foam

UNUSUAL FIRE AND EXPLOSION HAZARDS
Closed containers may explode (due to the build-up of pressure) when exposed to extreme heat.
During emergency conditions overexposure to decomposition products may cause a health hazard. Symptoms may not be immediately apparent. Obtain medical attention.

SPECIAL FIRE FIGHTING PROCEDURES
Full protective equipment including self-contained breathing apparatus should be used.
Water spray may be ineffective. If water is used, fog nozzles are preferable. Water may be used to cool closed containers to prevent pressure build-up and possible autoignition or explosion when exposed to extreme heat.

Section 6 -- ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Remove all sources of ignition. Ventilate the area.
Remove with inert absorbent.

Section 7 -- HANDLING AND STORAGE

STORAGE CATEGORY
Not Applicable

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE
Keep container closed when not in use. Transfer only to approved containers with complete and appropriate labeling. Do not take internally. Keep out of the reach of children.

Continued on page 3

Section 8 -- EXPOSURE CONTROLS/PERSONAL PROTECTION

PRECAUTIONS TO BE TAKEN IN USE

Use only with adequate ventilation.

Avoid contact with skin and eyes. Avoid breathing vapor and spray mist.

Wash hands after using.

This coating may contain materials classified as nuisance particulates (listed "as Dust" in Section 2) which may be present at hazardous levels only during sanding or abrading of the dried film. If no specific dusts are listed in Section 2, the applicable limits for nuisance dusts are ACGIH TLV 10 mg/m3 (total dust), 3 mg/m3 (respirable fraction), OSHA PEL 15 mg/m3 (total dust), 5 mg/m3 (respirable fraction).

Removal of old paint by sanding, scraping or other means may generate dust or fumes that contain lead. Exposure to lead dust or fumes may cause brain damage or other adverse health effects, especially in children or pregnant women. Controlling exposure to lead or other hazardous substances requires the use of proper protective equipment, such as a properly fitted respirator (NIOSH approved) and proper containment and cleanup. For more information, call the National Lead Information Center at 1-800-424-LEAD (in US) or contact your local health authority.

VENTILATION

Local exhaust preferable. General exhaust acceptable if the exposure to materials in Section 2 is maintained below applicable exposure limits. Refer to OSHA Standards 1910.94, 1910.107, 1910.108.

RESPIRATORY PROTECTION

If personal exposure cannot be controlled below applicable limits by ventilation, wear a properly fitted organic vapor/particulate respirator approved by NIOSH/MSHA for protection against materials in Section 2.

When sanding or abrading the dried film, wear a dust/mist respirator approved by NIOSH/MSHA for dust which may be generated from this product, underlying paint, or the abrasive.

PROTECTIVE GLOVES

Required for long or repeated contact.

EYE PROTECTION

Wear safety spectacles with unperforated sideshields.

Section 9 -- PHYSICAL AND CHEMICAL PROPERTIES

PRODUCT WEIGHT	9.75 lb/gal	1167 g/l
SPECIFIC GRAVITY	1.17	
BOILING POINT	212 - 213 F	100 - 100 C
MELTING POINT	Not Available	
VOLATILE VOLUME	60 %	
EVAPORATION RATE	Slower than ether	
VAPOR DENSITY	Heavier than air	
SOLUBILITY IN WATER	N.A.	
pH	9.0	
VOLATILE ORGANIC COMPOUNDS	(VOC Theoretical - As Packaged)	
0.01 lb/gal	2 g/l	Less Water and Federally Exempt Solvents
0.00 lb/gal	0 g/l	Emitted VOC

Continued on page 4

Section 10 -- STABILITY AND REACTIVITY

STABILITY -- Stable

CONDITIONS TO AVOID

None known.

INCOMPATIBILITY

None known.

HAZARDOUS DECOMPOSITION PRODUCTS

By fire: Carbon Dioxide, Carbon Monoxide

HAZARDOUS POLYMERIZATION

Will not occur

Section 11 -- TOXICOLOGICAL INFORMATION

CHRONIC HEALTH HAZARDS

No ingredient in this product is an IARC, NTP or OSHA listed carcinogen. Rats exposed to titanium dioxide dust at 250 mg./m3 developed lung cancer, however, such exposure levels are not attainable in the workplace.

TOXICOLOGY DATA

CAS No.	Ingredient Name				
13463-41-7	Zinc Pyrithione				
		LC50	RAT	4HR	Not Available
		LD50	RAT		177 mg/kg
13463-67-7	Titanium Dioxide				
		LC50	RAT	4HR	Not Available
		LD50	RAT		Not Available

Section 12 -- ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION

No data available.

Section 13 -- DISPOSAL CONSIDERATIONS

WASTE DISPOSAL METHOD

Waste from this product is not hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261.

Incinerate in approved facility. Do not incinerate closed container. Dispose of in accordance with Federal, State/Provincial, and Local regulations regarding pollution.

Section 14 -- TRANSPORT INFORMATION

No data available.

Section 15 -- REGULATORY INFORMATION

SARA 313 (40 CFR 372.65C) SUPPLIER NOTIFICATION

Continued on page 5

B10W951 page 5

CAS No.	CHEMICAL/COMPOUND	% by WT	% Element

No ingredients in this product are subject to SARA 313 (40 CFR 372.65C) Supplier Notification.

CALIFORNIA PROPOSITION 65

WARNING: This product contains chemicals known to the State of California to cause cancer and birth defects or other reproductive harm.

TSCA CERTIFICATION

All chemicals in this product are listed, or are exempt from listing, on the TSCA Inventory.

Section 16 -- OTHER INFORMATION

This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

The above information pertains to this product as currently formulated, and is based on the information available at this time. Addition of reducers or other additives to this product may substantially alter the composition and hazards of the product. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with any use of this information.

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Wood stains and transparent finishes.

1.2 RELATED SECTIONS

A. Section 06200 - Finish Carpentry: Wood items for transparent finish.
B. Section 06400 - Architectural Woodwork: Wood items for transparent finish.
C. Section 09900 - Paints and Coatings: Opaque finishes.

1.3 SUBMITTALS

A. Submit under provisions of Section 01300.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.
C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and finishes.
D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color and finish on wood of type to be finished.

1.4 QUALITY ASSURANCE

A. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MATERIALS - GENERAL REQUIREMENTS

A. Exterior Stains and Coatings - General:
   1. Unless otherwise indicated, provide factory-mixed materials. Mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials unless such procedure is specifically described in manufacturer's product instructions.
   2. Supply each material in quantity required to complete entire project's work from a single production run.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin application of coatings until substrates have been properly prepared.
B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

1. Clean surfaces thoroughly prior to installation.
2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Stir before and during application as recommended by manufacturer.
C. Do not apply to wet or damp surfaces.
D. Apply using methods recommended by manufacturer.
E. Apply without runs, drips, or sags, without brush marks, and with consistent sheen.
F. Apply at spreading rate required to achieve the manufacturer's recommended film thickness.

3.4 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion

MATERIAL SAFETY DATA SHEET

SECTION 1 - PRODUCT AND COMPANY INFORMATION

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

EMERGENCY PHONE NUMBERS (24 hours/day): **(412) 434-4515 (U.S.)**
(514) 645-1320 (Canada)
01-800-00-21-400 (Mexico)
0532-3889090 (China)

TECHNICAL INFORMATION: 1-800-441-9695 (8:00 am to 5:00 pm EST)
PRODUCT SAFETY/MSDS INFORMATION: (412) 492-5555 7:00 a.m. - 4:30 p.m. EST
Product ID: 42786 (0814)
PRODUCT NAME: OLYMPIC WB POLYURETHANE S
SYNONYMS: None
ISSUE DATE: 05/10/2005
EDITION NO.: 1
CHEMICAL FAMILY: Acrylic Urethane

EMERGENCY OVERVIEW:
CAUSES EYE IRRITATION. MAY CAUSE SLIGHT SKIN IRRITATION. VAPOR AND/OR SPRAY MIST MAY BE HARMFUL IF INHALED.HARMFUL IF SWALLOWED. This product is not expected to present any unusual hazards under fire or spill conditions. Read entire MSDS before use.

SECTION 2 - COMPOSITION INFORMATION

The following ingredient(s) marked with an "x" are considered hazardous under applicable U.S. OSHA and/or Canadian WHMIS regulations. If no ingredients are listed, then there are no U.S. OSHA and/or Canadian WHMIS hazardous ingredients in this product.

Material/ CAS Number	Percent	Hazardous
DIPROPYLENE GLYCOL MONOBUTYL ETHER 29911-28-2	3 - 7	X
N-METHYL-2-PYRROLIDONE 872-50-4	0.1-1.0	X

SECTION 3 - HAZARDS IDENTIFICATION

ACUTE OVEREXPOSURE EFFECTS

EYE CONTACT:
Causes eye irritation. Redness, itching, burning sensation and visual disturbances may indicate excessive eye contact.
SKIN CONTACT:
May cause slight skin irritation. Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.
SKIN ABSORPTION:
Skin absorption not expected to occur.
INHALATION:
Vapor and/or spray mist may be harmful if inhaled.
INGESTION:
Harmful if swallowed.
SIGNS & SYMPTOMS OF OVEREXPOSURE:
Dryness, itching, cracking, burning, redness, and swelling are conditions associated with excessive skin contact.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Not applicable.
CHRONIC OVEREXPOSURE EFFECTS
Avoid long-term and repeated contact.
This product contains n-methylpyrrolidone (NMP). The U.S. EPA has concluded that NMP may cause reproductive and developmental effects. Preventing skin exposure with protective clothing and gloves can reduce this risk.
The effects of long-term, low level exposures to this product have not been determined. Safe handling of this material on a long-term basis should emphasize the prevention of all contact with this material to avoid any effects from repetitive acute exposures. See Section 11, of this MSDS for a detailed list of chronic health effects information available on individual ingredients in this product.

SECTION 4 - FIRST AID MEASURES

If ingestion, irritation, any type of overexposure or symptoms of overexposure occur during or persists after use of this product, contact a POISON CONTROL CENTER, EMERGENCY ROOM OR PHYSICIAN immediately; have Material Safety Data Sheet information available.
EYE CONTACT:
Remove contact lens and pour a gentle stream of warm water through the affected eye for at least 15 minutes. If irritation persists, contact a poison control center, emergency room, or physician as further treatment may be necessary.
SKIN CONTACT:
Run a gentle stream of water over the affected area for 15 minutes. A mild soap may be used if available. If any symptoms persist, contact a poison control center, emergency room, or physician as further treatment may be necessary.
INHALATION:
Remove from area to fresh air. If symptomatic, contact a poison control center, emergency room or physician for treatment information.
INGESTION:
Gently wipe or rinse the inside of the mouth with water. Sips of water may be given. Never give anything by mouth to an unconscious person. Contact a poison control center, emergency room or physician right away as further treatment may be necessary.

SECTION 5 - FIRE FIGHTING MEASURES

FLAMMABLE PROPERTIES
FLASHPOINT: 210 Degrees F (99 Degrees C)
FLASHPOINT TEST METHOD:
Pensky-Martens Closed Cup
UEL: Not Available.
LEL: Not Available.
AUTOIGNITION TEMPERATURE:
Not Available.
EXTINGUISHING MEDIA:
Use National Fire Protection Association (NFPA) Class B extinguishers (carbon dioxide, dry chemical or universal aqueous film forming foam) designed to extinguish NFPA Class IIIB combustible liquid fires.
PROTECTION OF FIREFIGHTERS:
Water spray may be ineffective. Water spray may be used to cool closed containers that are exposed to extreme heat. If water is used, fog nozzles are preferable. Firefighters should wear self-contained breathing apparatus and full protective clothing.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Closed containers may explode or burst (due to the build-up of steam pressure) when exposed to extreme heat. May produce hazardous decomposition products when exposed to extreme heat. Extreme heat includes, but is not limited to, flame cutting, brazing, and welding.

SECTION 6 - ACCIDENTAL RELEASE MEASURE

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Provide maximum ventilation. Only personnel equipped with proper respiratory, skin, and eye protection should be permitted in the area. Remove all sources of ignition. Take up spilled material with sand, vermiculite, or other noncombustible absorbent material and place in clean, empty containers for disposal. Only the spilled material and the absorbant should be placed in this container.

PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15272

Product ID: 42786 (0814)
PRODUCT NAME: OLYMPIC WB POLYURETHANE S

SECTION 7 - HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE:
If this material is part of a multiple component system, read the Material Safety Data Sheet(s) for the other component or components before blending as the resulting mixture may have the hazards of all of its parts.
STORAGE:
Protect from freezing.

SECTION 8 - EXPOSURE CONTROLS & PERSONAL PROTECTION

ENGINEERING CONTROLS:
Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 8 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.

PERSONAL PROTECTIVE EQUIPMENT
EYES:
Wear safety glasses with side shields.
SKIN/GLOVES:
Wear protective clothing to prevent skin contact. Apron and gloves should be constructed of: neoprene rubber or nitrile rubber. No specific permeation/degradation testing have been done on protective clothing for this product. Recommendations for skin protection are based on infrequent contact with this product. For frequent contact or total immersion, contact a manufacturer of protective clothing for appropriate chemical impervious equipment. Clean contaminated clothing and shoes.
RESPIRATOR:
Where ventilation is inadequate, use a NIOSH- approved air purifying respirator with the appropriate chemical cartridges or positive- pressure, air-supplied respirator. Read the respirator manufacturer's instructions and literature carefully to determine the type of airborne contaminants against which the respirator is effective, its limitations, and how it is to be properly fitted and used. Provide general dilution or local exhaust ventilation in volume and pattern to keep the concentration of ingredients listed in Section 2 below the lowest suggested exposure limits, the LEL below the stated limit, and to remove decomposition products during welding or flame cutting.
GENERAL HYGIENE - ESTABLISHED EXPOSURE LIMITS
If Threshold Limit Values (TLVs) have been established by ACGIH, OSHA, Ontario or PPG, they will be listed below. These limits are intended for use in the practice of industrial hygiene as guidelines or recommendations in the control of potential workplace health hazards. These limits are not a relative index of toxicity and should not be used by anyone without industrial hygiene training.

Key: OSHA=Occupational Safety and Health Administration; PEL=Permissable Exposure Limit; Ceiling=PEL Ceiling Limit; STEL=PEL Short-Term Exposure Limit; Skin=OSHA Skin Designation.

Material/ CAS Number	Percent	Ontario TWA	Ontario STEL	PPG IPEL	PPG STEL
N-METHYL-2-PYRROLIDONE 872-50-4	0.1-1.0	400 MG/m^3	Not established	10 ppm	Not established

Key: ACGIH=American Conference of Governmental Industrial Hygienists; OSHA=Occupational Safety and Health Administration; TLV=Threshold Limit Value; TWA=Time Weighted Average; PEL=Permissible Exposure Limit; IPEL=Internal Permissible Exposure Limit; Ceiling=TLV or PEL Ceiling Limit; STEL=TLV or PEL Short-Term Exposure Limit; Skin= Skin Absorption Designation. [C- Ceiling Limit; S-Potential Skin Aborption; R-Respirable Dust]
Additional Information Not applicable.

SECTION 9 - PHYSICAL & CHEMICAL PROPERTIES
(FORMULA VALUES, NOT SALES SPECIFICATIONS)

SPECIFIC GRAVITY:	1.027
PHYSICAL STATE:	Liquid
Percent Solids:	27.09
Percent Volatile by Volume:	75.610
pH:	8.2
ODOR THRESHOLD:	Not available.
Vapour Pressure:	17.4 mmHg
ODOR/APPEARANCE:	Viscous liquid with an odor characteristic of the chemical family and any solvents listed in Section 2.
VAPOR DENSITY:	HEAVIER THAN AIR
Evaporation Rate:	34
BOILING POINT OR RANGE:	185 - 450Degrees F
Freezing Point or Range:	Not Applicable.
Melting Point or Range(°C):	Not Applicable.
Octanol/Water Partition Coefficient:	Not Applicable.
WEIGHT PER GALLON:	8.56 (U.S.) / 10.2 (IMPERIAL)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY:
This product is normally stable and will not undergo hazardous reactions.
CONDITIONS TO AVOID:
None Known.
INCOMPATIBLE MATERIALS:
Avoid contact with strong alkalies, strong mineral acids, or strong oxidizing agents.
HAZARDOUS POLYMERIZATION:
None Known.
HAZARDOUS DECOMPOSITION PRODUCTS:
- Carbon monoxide - Carbon dioxide - Traces of isocyanate - Oxides of nitrogen - Hydrogen cyanide - Lower molecular weight polymer fractions

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Material/ CAS Number	Percent	ORAL LD50 (g/kg)	DERMAL LD50 (g/kg)	INHALATION LC50 (mg/l)
DIPROPYLENE GLYCOL MONOBUTYL ETHER 29911-28-2	3 - 7	4.05 g/kg	Not Available	Not Available
N-METHYL-2-PYRROLIDONE 872-50-4	0.1-1.0	3.91 g/kg	8.00 g/kg	Not Available

CHRONIC TOXICITY
Target Organs:
- Reproductive - Teratogen - None known

Mutagenicity:
This has not been tested for this product.
Reproductive:
This has not been tested for this product.

SUPPLEMENTAL HEALTH INFORMATION:

SECTION 12 - ECOLOGICAL INFORMATION

POTENTIAL ENVIRONMENTAL EFFECTS
Ecotoxicity: No Information Available.

ENVIRONMENTAL FATE

Mobility: No Information Available.
Biodegradation: No Information Available.
Bioaccumulation: No Information Available.

PHYSICAL/CHEMICAL

Hydrolysis: No Information Available.
Photolysis: No Information Available.

SECTION 13 - DISPOSAL CONSIDERATIONS

Provide maximum ventilation, only personnel equipped with proper respiratory and skin and eye protection should be permitted in the area. Take up spilled material with sawdust, vermiculite, or other absorbent material and place in containers for disposal.
Waste material must be disposed of in accordance with federal, state, provincial and local environmental control regulations. Empty containers should be recycled by an appropriately licensed reconditioner/salvager or disposed of through a permitted waste management facility. Additional disposal information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.

SECTION 14 - TRANSPORTATION INFORMATION

Proper Shipping Name: Paint- Non-Regulated Goods
NOS Technical Name: None
Hazard Class: None
Subsidiary Class(es): None
UN Number: None
Packing Group: None

USA - RQ Hazardous Substances: None
USA-RQ Hazardous Substance Threshold Ship Weight: None
Marine Pollutant Name: None

SECTION 15 - REGULATORY INFORMATION

INVENTORY STATUS
U.S. TSCA: This product and/or all of its components are listed on the U.S. TSCA Inventory or is otherwise exempt from TSCA Inventory reporting requirements.
FEDERAL REGULATIONS
US Regulations

Material/ CAS Number	Percent	CERCLA HS - RQ (LBS)	SARA EHS- TPQ (LBS)	SARA 313
DIPROPYLENE GLYCOL MONOBUTYL ETHER 29911-28-2	3 - 7	Not Listed	Not Listed	Not Listed
N-METHYL-2-PYRROLIDONE 872-50-4	0.1-1.0	Not Listed	Not Listed	Listed

SARA 311/312
Health (acute): Yes
Health (chronic): No
Fire (flammable): No
Pressure: No
Reactivity: No
WHMIS HAZARD CLASS: - Class D, Division 2, Subdivision A

STATE/PROVINCIAL REGULATIONS
CALIFORNIA PROP. 65: WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Additional Information

Key: IARC- International Agency on the Research of Cancer; ACGIH- American Conference of Governmental Industrial Hygienists; NTP- National Toxicology Program *Denotes chemical as NTP Known Carcinogen; + Denotes NTP Possible Carcinogen; OSHA- Occupational Safety and Health Administration.

SECTION 16 - OTHER INFORMATION

Hazard Rating Systems
NFPA Rating: 2 10
HMIS Rating: 2 10

Rating System: 0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe, *=Chronic Effects.

HMIS=Hazardous Materials Identification System; NFPA=National Fire Protection Association;

Safe handling of this product requires that all of the information on the MSDS be evaluated for specific work environments and conditions of use.

PREPARED BY: Product Safety Department
REASON FOR REVISION: Section 11 has been updated. Section 1 has been updated. Section 15 has been updated.
Updated MSDS
format.

This Material Safety Data Sheet has been prepared in accordance with Canada's Workplace Hazardous Materials Information System (WHMIS) and the OSHA Hazard Communication Standard (29 CFR 1910.1200), the supplier notification requirements of SARA Title III, Section 313 and other applicable right-to-know regulations.
Additional environmental information is contained on the Environmental Data Sheet for this product, which can be obtained from your PPG representative.
42786 000011 (00343359.001)(05/09/05)
050118, 000, 0814

*** END OF MSDS ***

END OF SECTION 09 93 00

Division 10: Specialties

SECTION 10 71 00 - EXTERIOR PROTECTION 10 71 00-1

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Control heat gain through use of awnings and trellises (conserves energy).
B. Control heat gain through use of shade screens (conserves energy).
C. Light shelves can be integrated into sun shading device, blocking direct sun and increasing reflected light.

1.2 SUBMITTALS

A. Submit computer model quantifying energy performance compared to baseline building.
B. Model daylighting strategies (physical or computer model). Provide footcandle levels and daylight factor achieved.

PART 2 – PRODUCTS

2.1 Solar Shading Devices

A. Shade Screens: Louvers of one of the following materials are to be selected by the Owner/ Architect.
B. Wood:
    1. Rot-resistant species
    2. FSC-certified
    3. Salvaged lumber
C. Metal: of high recycled content
D. Plastic: of high recycled content

2.2 Trellis

A. The following manufacturer's are may be used for the trellis:
    1. Extren
        a. Shape: channel or square tube
    2. Dynaform

PART 3 - EXECUTION

3.1 WASTE MANAGEMENT

A. Separate packaging materials in accordance with the Waste Management Plan and place in designated areas for recycling.

END OF SECTION 10 71 00

Division 11: Equipment

Section 11 28 13 - Computers
Section 11 31 00 – Residential Appliances
Section 11 82 23 – Recycling Equipment

SECTION 11 28 13 – COMPUTERS 11 28 13-1

PART 1 – GENERAL

A. This section includes information for the MacBook laptop computer to be used

PART 2 – PRODUCTS

2.1 COMPUTER

B. 17-inch MacBook Pro

2.2 SPECIFICATIONS

Processor and memory
• 2.16GHz Intel Core Duo processor
• 2MB on-chip shared L2 cache
• 667MHz frontside bus
• 1GB (single SO-DIMM) of 667MHz DDR2 SDRAM (PC2-5300); two SO-DIMM slots support up to 2GB
Storage
• 120GB 5400-rpm Serial ATA hard drive; optional 100GB 7200-rpm drive8
• Slot-loading SuperDrive (DVD+R DL/DVD±RW/CD-RW)
– Maximum write speeds: 8x DVD-R and DVD+R; 4x DVD-RW and DVD+RW; 2.4x DVD+R (double layer); 24x CD-R; 16x CD-RW
– Maximum read speeds: 8x DVD-ROM (single layer); 6x DVD-ROM (double layer), DVD-R, DVD-RW, DVD+R, and DVD+RW; 24x CD-R
Communications
• Built-in 54-Mbps AirPort Extreme wireless networking4 (based on 802.11g standard)
• Built-in 3-Mbps Bluetooth 2.0 + Enhanced Data Rate (EDR)
• Built-in 10/100/1000BASE-T Gigabit Ethernet (RJ-45 connector)
Expansion
• One FireWire 400 port at up to 400 Mbps11
• One FireWire 800 port at up to 800 Mbps11
• Three USB 2.0 ports at up to 480 Mbps
• ExpressCard/34 slot
Display
• 17-inch (diagonal) TFT widescreen display with support for millions of colors
• Supported resolutions: 1680 by 1050 (native), 1280 by 800, 1152 by 720, 1024 by 640, and 800 by 500 at 16:10 aspect ratio; 1280 by 1024 at 5:4 aspect ratio; 1280 by 1024 at 5:4 aspect ratio stretched; 1024 by 768, 800 by 600, and 640 by 480 at 4:3 aspect ratio; 1024 by 768, 800 by 600, and 640 by 480 at 4:3 aspect ratio stretched; 720 by 480 at 3:2 aspect ratio; 720 by 480 at 3:2 aspect ratio stretched
Video and graphics support
• ATI Mobility Radeon X1600 graphics processor with 256MB of GDDR3 SDRAM and dual-link DVI support
• Extended desktop and video mirroring: Simultaneously supports full native resolution on the built-in display and up to 2560 by 1600 pixels on an external display, both at millions of colors15
• DVI output port
• VGA output using included DVI to VGA adapter
• Built-in iSight VGA video camera with 640-by-480-pixel resolution
Audio
• Combined optical digital audio input/audio line in (minijack)
• Combined optical digital audio output/headphone out (minijack)
• Built-in stereo speakers
• Internal omnidirectional microphone (located under left speaker grille)
Battery and power
• 68-watt-hour lithium-polymer battery with integrated charge indicator LEDs

• 85W MagSafe Power Adapter with cable management system
• MagSafe power adapter port
Security
• Kensington cable lock slot
Input
• Built-in full-size keyboard with 78 (U.S.) or 79 (ISO) keys, including 12 function keys, 4 arrow keys (inverted "T" arrangement), and embedded numeric keypad
• Illuminated fiber-optic backlit keyboard with ambient light sensor for automatic adjustment of keyboard illumination and screen brightness
• Solid-state scrolling trackpad for precise cursor control; supports two-finger scrolling, tap, double-tap, and drag capabilities
• Apple Remote
Electrical and environmental requirements
• Meets ENERGY STAR requirements
• Line voltage: 100V AC or 240V AC
• Frequency: 50Hz to 60Hz
• DC input: 18.5 Vdc, 4.6A maximum
• Operating temperature: 50° to 95° F (10° to 35° C)
• Storage temperature: –13° to 113° F (–24° to 45° C)
• Relative humidity: 0% to 90% noncondensing
• Maximum operating altitude: 10,000 feet
• Maximum storage altitude: 15,000 feet
• Maximum shipping altitude: 35,000 feet
Size and weight
• Height: 1.0 inch (2.59 cm)
• Width: 15.4 inches (39.2 cm)
• Depth: 10.4 inches (26.5 cm)
• Weight: 6.8 pounds (3.1 kg) with battery and optical drive installed7

END OF SECTION 11 28 13

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Problems:
   1. Appliances consume energy (for compressor operation, motor operation, and water heating).
   2. Washing machines and dishwashers consume water.
B. Recommendations:
   1. Select energy-efficient appliances (conserves energy).
   2. Select water-conserving appliances (conserves water).
   3. Select appliances that are durable and easy to maintain (conserves resources).
   4. Select appliances manufactured to facilitate disassembly and recycling.
   5. Provide direct venting of gas appliance to exterior.

1.2RELATED LEED™ CREDITS

A. Water Efficiency -- Credit 3 -- Water Use Reduction
B. Energy & Atmosphere -- Credit 1 -- Optimize Energy Performance

1.3 SUBMITTALS

A. Manufacturer's specifications, including annual energy and/or water consumption
B. EPA's Energy Star® rating

1.4 DEFINITIONS

A. Modified Energy Factor (MEF): Clothes washer energy use per volume of tub capacity; higher factors represent higher efficiencies. MEF values factor in remaining moisture content, which is indicative of energy required for drying.
B. Water Factor (WF): A measure of water use per cubic foot of laundry. A lower WF indicates lower water consumption (greater water efficiency).

PART 2 - PRODUCTS

2.1 WASHING MACHINE

A. Model ASKO W6461: Minimum water consumption (5.7 gallons), Wash temperature options (cold, 85-205)
B. Minimum Modified Energy Factor = 1.42, maximum WF of 9.5
C. Horizontal-axis
D. Vertical-axis with special water- and energy-conserving features
E. *Maximum spin speeds: 1,600 rpm.*
F. Stainless steel inner and outer tanks, internal water heater (from 85º to 205º F), Quattro no-walk suspension, and top-loader-like capacity
G. Standard Features
   1. Adjustable spin speeds from 400 to 1,600 rpm
   2. Stainless steel inner and outer tanks never rust, chip or absorb odors
   3. Internal heater produces optimal temperatures throughout the entire wash cycle
   4. Capacity that matches any top-loader-14 towels and most queen-size comforters
   5. Smaller exterior allows for more convenient installations--under counters or stacked in closets
   6. 20-year life expectancy
   7. Solid rubber SmartSeal™ door gasket eliminates troublesome bellows that crack and leak
   8. Quick Wash cycle will clean better than an old-style agitator and do it in only 35 minutes while using only 5.7 gallons of water and 0.3 (2¢) kWh of electricity
   9. Quattro™ four-shock suspension & Automatic Load Balancing System ensures quiet, virtually vibration free spin
   10. Easy-to-reach, out-front controls

2.2 DRYER

A. Model ASKO T731 (Vented): Timed dry program (5-90 minutes)
B. Condensing Dryer: [Releases generated heat inside building, reclaiming latent heat of water vapor and

lowering wintertime heating loads]

C. Standard features:
   1. Butterfly Drying™ System that reduces wrinkles and extends motor life
   2. Large capacity, stainless steel drum also reduces wrinkles and won't snag clothing
   3. Anti-crease program
   4. Drying 20-year life expectancy
   5. Cleanable fan reduces need for service calls
   6. Reversible door
   7. Double lint filter covers entire door
   8. Stacking kit included for ASKO washer
   9. Timed drying program
   10. Includes 220 V, 20amp receptacle for ASKO washer

Dimensions

Height:	33-1/2" - 34-1/2"
Width:	23-7/16"
Depth with Door Open:	46-1/16"
Depth with Door Closed:	24-7/16"

2.3 REFRIGERATOR

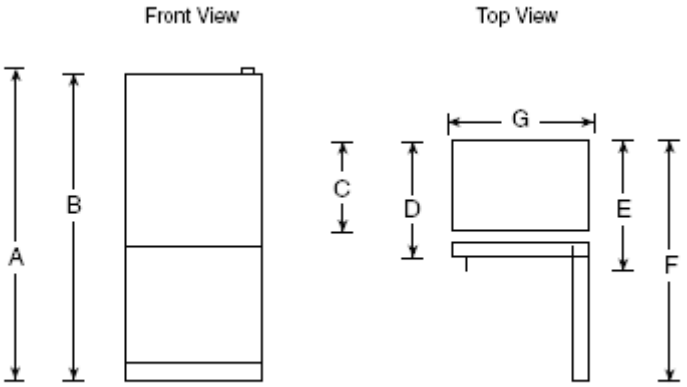
A. Shall meet 2001 DOE energy
B. GE Profile™ ENERGY STAR® 19.5 Cu. Ft. Stainless Bottom-Freezer Drawer Refrigerator
C. Model: PDS20SBSLSS
D. Uses least energy: 476 kWh/year, Uses most energy: 573 kWh/year, Estimated yearly operating cost: $42, Defrost type: Automatic, Compact: No, Ice: No, Volume 19.52, Adjusted volume 23.50, kWh/year: 453, Federal Standard kWh/year: 567, Percent Better: 20%, Active: yes, Active Date: 4/6/2006

Dimensions and Installation Information (in inches)

Overall Dimensions	Height to top of hinge (in.) A	68
	Height to top of case (in.) B	67-1/4
	Case depth without door (in.) C	28-1/4
	Case depth less door handle (in.) D	31-3/4
	Case depth with door handle (in.) E	33-7/8
	Depth with fresh food door open 90° (in.) F	59
	Width (in.) G	29-7/8
	Width with door open 90° inc. door handle (in.) H	33-1/4
Air Clearances	Each side (in.)	1/8
	Top (in.)	1
	Back (in.)	1

Note: All Right-Hand Refrigerator Doors: As you face the front of the refrigerator, the handle is on your left and the hinges are on your right.

Note: All Left-Hand Refrigerator Doors: As you face the front of the refrigerator, the handle is on your right and the hinges are on your left.



2.4 DISHWASHER

A. Model: ASKO D3251FI: stainless steel, Maximum wash and rinse temperature of 170°F, Height (43 3/8" to 37"), Width of 24", Depth of 25 5/8", Depth from cabinet with door open (48 1.4")
B. Minimum Energy Factor = 0.60 (Energy Star® standard = 0.58; National energy standard = 0.46)
C. Standard ASKO Dishwasher Features
   1. 18:9 stainless steel tank, spray arms and filtration system won't rust, chip or absorb odors.
   2. One-piece, galvanized steel base pan provides superior structural integrity and reduces vibrations. Not available on any competitively made U.S. unit.

3. Two pumps/two motors (versus one each on most dishwashers) save water and electricity, and last longer.
4. Door springs are designed to last 20 years.
5. No space-stealing central water tower or connectors.
6. 12+ International place setting capacity.
7. Controls are double-sealed from moisture.
8. Racks are coated with Viscant™ graphite nylon. Tines are double-coated and cushioned on top.

Dimensions of Tall (XL) Tank Model	
Height:	33-3/4" - 35-3/4"**
Width:	23-5/8"
Depth:	22-7/8"*
Depth from Cabinet with Door Open:	48-1/4"
Dimensions of Standard Tank Model	
Height:	32-1/4" - 35-1/2"
Width:	23-5/8"
Depth:	22-7/8"*
Depth from Cabinet with Door Open:	47-1/8"
Standard Tank Model complies with ADA height guidelines	

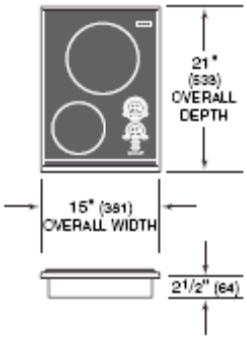
* Does not include the depth of a custom door or optional door. If an ASKO optional door is used, add 2-1/2" depth.
** Does not include the height of a custom or optional door.

2.5 WOLF INTEGRATED INDUCTION COOKTOP

A. Model: CT151/S (15” electric)
B. Gas: [Higher overall energy efficiency than electric resistant burners; can create indoor air quality problems]
C. Electric: [Generally preferred for indoor-air-quality reasons]
D. Standard features
   1. Integrated design allows for installation of multiple cooktops or modules
   2. Classic stainless steel trim finish
   3. Easy-to-clean black ceramic glass surface is resistant to scratching, staining, impact and heat
   4. Induction elements heat cookware, not the glass, for a cooler, safer cooking surface
   5. Cookware sensing—elements will not be energized without an iron or magnetic stainless steel pan on the cooktop surface
   6. Illuminated electronic touch controls with graduated control lighting
   7. High-efficiency elements deliver power and control
   8. Hi-Power mode boosts power on rear element to 2200 W maximum power output by diverting power from front element
   9. Simultaneous operation of both elements at 1800 W power output each
   10. True Simmer setting on both elements
   11. Melt setting on both elements
   12. Temperature limiter to ensure that safe operating temperature of ceramic glass is never exceeded
   13. Child safety lock key and universal off
   14. CSA certified for US and Canada
   15. Two and five year residential warranty – exclusions apply; warranty information can be found on our website, wolfappliance.com
E. VENTILATION OPTIONS
   1. 30" (762) Cooktop or Pro wall hood or liner
   2. 30" (762) or 45" (1143) downdraft ventilation system
   3. 36" (914) Cooktop or Pro island hood
F. Accessories
   1. Filler strip
   2. Bracket supports for installation of two integrated modules with downdraft (Model DD30 only)

SPECIFICATIONS	
Overall Cooktop Width	15" (381)
Overall Cooktop Height	2 1/2" (64)
Overall Cooktop Depth	21" (533)
Cooktop Cut-Out Width	13 3/8" (340)
Cooktop Cut-Out Depth	19 1/4" (489)
Minimum Cabinet Depth	22 3/4" (578)
Minimum Height Clearance	6" (152)
Element Maximum Power	(front) 1800 W (rear) 2200 W
Electrical Supply Requirements	240/208 V AC, 60 Hz 20 amp dedicated circuit
Conduit	4 ft (1.2 m) flexible 3-wire
Electrical Rating	3.4 kW at 240 V 2.6 kW at 208 V
Shipping Weight	30 lbs (14 kg)
Special Note	Cooktop can be installed in combination with other cooktops or modules

OVERALL DIMENSIONS



DIMENSIONS	
Cooktop Cut-Out Width	13 3/8" (340)
Cooktop Cut-Out Depth	19 1/4" (489)
Minimum Height Clearance	6" (152)
Minimum Cabinet Depth	22 3/4" (578)
Location of Electrical	Within shaded area

PART 3 – INSTALLATION
3.1 LAUNDRY

IMPORTANT SAFETY INSTRUCTIONS

To reduce the risk of fire, electric shock, or injury to persons when using your appliance, follow basic precautions, including the following:

- Read all instructions before using the appliance.
- Do not run appliance while you are out of the home.
- Do not wash or dry articles that have been previously cleaned in, washed in, soaked in, or spotted with gasoline, dry-cleaning solvents, cooking oils, or other flammable or explosive substances because they give off vapors that could ignite or explode.
- Do not allow children to play on or in the appliance. Close supervision of children is necessary when the appliance is used near children.
- Before the appliance is removed from service or discarded, remove the door to the washing compartment.
- Do not reach into the appliance if the drum is moving.
- Do not install or store this appliance where it will be exposed to the weather.
- Do not tamper with controls.
- Do not repair or replace any part of the appliance or attempt any servicing unless specifically recommended in the user-repair instructions or in published user-repair instructions that you understand and have the skills to carry out.
- Do not add gasoline, dry-cleaning solvents, or other flammable or explosive substances to the wash water. These substances give off vapors that could ignite or explode.
- Under certain conditions, hydrogen gas may be produced in a hot water system that has not been used for 2 weeks or more. HYDROGEN GAS IS EXPLOSIVE. If the hot water system has not been used for such a period, before using a washing machine or combination washer-dryer, turn on all water faucets and let the water flow from each for several minutes. This will release any accumulated hydrogen gas. As the gas is flammable, do not smoke or use an open flame during this time.

WARNING!
This appliance must be properly grounded.

GROUNDING INSTRUCTIONS

A) Grounding instructions for a grounded, cord-connected appliance

In the event of malfunction or breakdown, grounding will reduce the risk of electric shock by providing a path of least resistance for electric current. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING!
Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service representative or personnel if you are in doubt as to whether the appliance is properly grounded.

Do not modify the plug provided with the appliance. If it will not fit the outlet, have a proper outlet installed by a qualified electrician.

B) Grounding instructions for a permanently connected appliance:

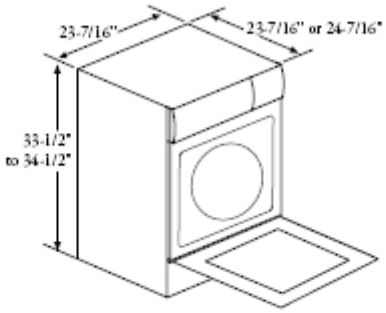
This appliance must be connected to a grounded metal, permanent wiring system, or an equipment-grounding terminal or lead on the appliance.

NOTE: This manual does not cover every possible condition and situation that may occur. Use common sense and caution when installing, operating, and maintaining any appliance.

INSTALLATION

Laundry

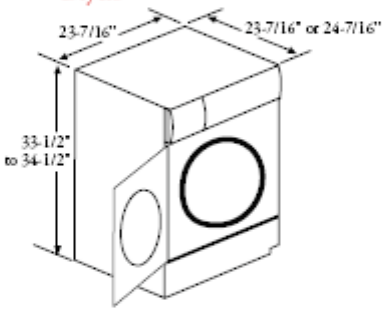
Washers



Depth with Door Open
W600 & W640 — 36-3/8"
W620 & W660 — 42-3/8"

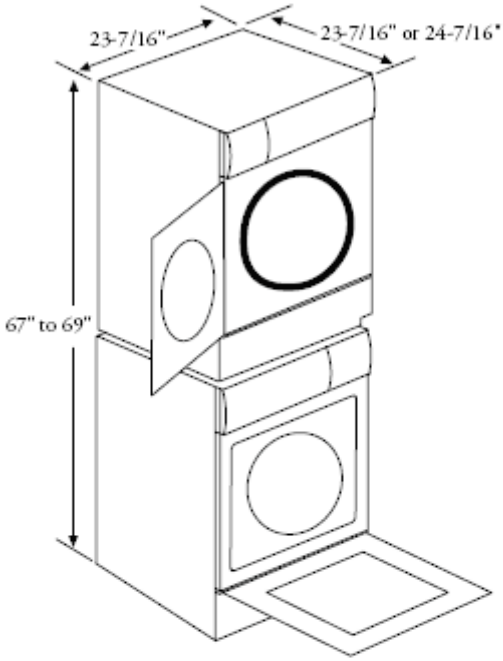
Depth with Door Closed
W600 & W620 — 24-7/16"
W640 & W660 — 23-7/16"

Dryers



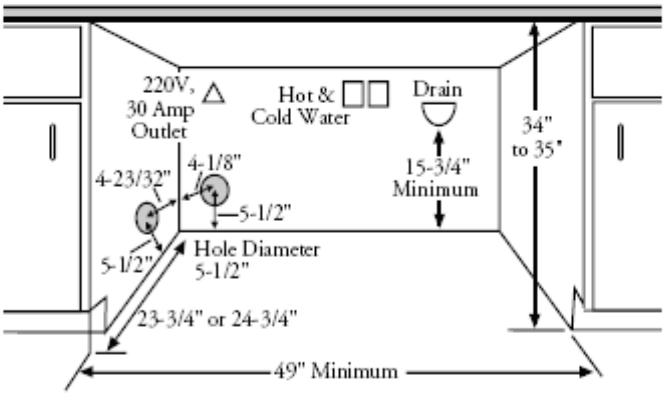
Depth with Door Open
46-1/16"

Depth with Door Closed
T700 & T720 — 24-7/16"
T760 & T780 — 23-7/16"



Under Counter Installations

These units can be installed in free-standing installations. This shows the traditional built-in layout: dryer on left and washer on right. To reverse this, simply reverse the installation specs. These units can also be built in under a 34" to 35" high counter. The minimum counter width is 49" for a pair. This 49" width allows 1/2" of space on the outside edges and between the units, otherwise units may bump wall/cabinet or each other during spin cycles. This also allows for sufficient air circulation for dryer.



Electrical, Water And Code Requirements

The washers have a 220 V line that plugs into an ASKO dryer or a standard 220 V, 20 amp single phase outlet. ASKO dryers plug into standard 220V, 30 amp circuit. The washers connect to the cold-water outlet. The water pressure must be between 15 – 146 PSI. Second floor (above grade) installations must meet all local building codes.

See Use & Care Guide for detailed installation instructions.

INSTALLATION INSTRUCTIONS

Read these instructions carefully and completely before you install the machine. The installation should be carried out by a qualified person who is familiar with all local codes and ordinances for electrical and plumbing connections.

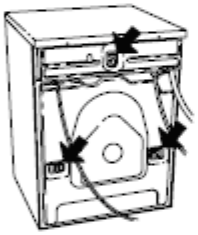
IMPORTANT NOTE:
Cosmetic damage must be reported to your dealer within five days from the date of purchase. After unpacking the washer, thoroughly check the unit for cosmetic damage.

SPECIFICATIONS

Height	33-1/2"–34-1/2 (850–876 mm)
Width	23-7/16" (595 mm)
Depth	W6021/W6461: 24-7/16" (620 mm)
Weight	167 lbs. (73 kg)
Rated load	See data plate
Supply voltage	Single-phase 230 V, 60 Hz
Heating element	2000 W
Fuse	15 A (2 internal fuses)
Drum and Barrel	Stainless steel
Outer casing	Stove-enamelled hot-dipped galvanized steel or stainless steel
Mounting	Four adjustable rubber-covered feet
Inlet supply hose	5 ft. (1.5 m) PEX tubing with brass ferrules
Supply pressure	15–142 PSI
Outlet hose	5.5 ft. (1.7 m) polypropylene hose, 3/4" ID

REMOVING THE SHIPPING SUPPORTS

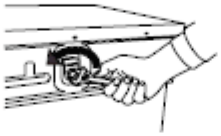
The machine is transported with three shipping supports, as illustrated below. These supports hold the tub in place during shipment. When you unpack the machine, you must remove these supports.



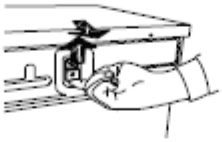
You must remove the shipping supports before you install the washer.

To remove the shipping supports, follow the instructions below:

1. Unscrew the 5/8" (12 mm) bolts holding the supports in place and remove the bolts.

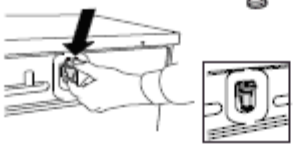


2. Push the rubber spacer up then pull it out of the slot.



3. Rotate the spacer so that the extruded end points toward the machine.

4. Insert it into the slot and push down to lock it into position.



LEVELING THE MACHINE

It is important that the machine is level so it won't vibrate excessively during the spinning cycles. Each foot on the washer is adjustable, so you can level the washer on any surface. Once it is level, securely tighten the lock nuts on the feet to prevent excessive vibration during the spin cycles.

Be sure to tighten the lock nuts securely when you level the machine.

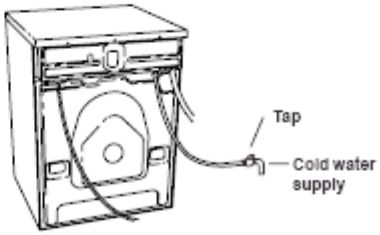
WATER SUPPLY CONNECTION

Because ASKO washers have their own heating element, you only need to have a cold water inlet. The connection should be made by someone who is sufficiently skilled. Use the hose supplied with the washer. (The inlet hose is marked for proper connections.)

Water pressure must be in the range of 15–146 PSI.

A tap should be fitted on the water supply pipe.

If a new supply pipe has been installed for the washer, it should be flushed thoroughly to remove any foreign particles that might clog the strainer in the water inlet.

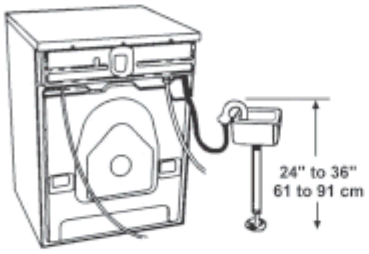


NOTE: If unit is installed on a second story, follow local building codes. We recommend a drip pan be installed.

DRAIN OUTLET CONNECTION

The machine is supplied with the outlet hose already attached. The hose should be extended over a suitable sink edge or drain pipe at a height of 24" to 36" (610 mm to 914 mm) above the bottom of the unit. (The lower height is preferable.) Make sure that the hose is not kinked.

NOTE: If the hose is extended, the internal diameter of the coupling must not be less than 1/2".



WARNING! **Do not extend the drain hose higher than 36" (914 mm) from the bottom of the unit.**

ELECTRICAL CONNECTIONS

The machine is delivered ready-fitted with a plug and is intended for connection to an ASKO Dryer, which is equipped with a matching receptacle. The plug supplied with the washer can only be used with an ASKO Dryer. If the washer is used separately or with another dryer, it must be on a separate 220 V single-phase circuit.

If the machine is to be used in a wet area, the supply must be protected by a residual current device.

As supplied: 230 V, 60 Hz
2000 W heating element
15 A fuse required

WARNING! **Connection to a permanently wired supply point must be made only by a qualified electrician.**

GROUNDING INSTRUCTIONS

This appliance must be grounded. In the event of malfunction or breakdown, grounding will reduce the risk of electric shock by providing a path of least resistance for electric current. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

WARNING! **Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or serviceman if you are in doubt as to whether the appliance is properly grounded.**

Do not modify the plug provided with the appliance. If it will not fit the outlet, have a proper outlet installed by a qualified electrician.

FREESTANDING INSTALLATION

The washer can be placed next to the dryer. It is essential that the machine is leveled and the locknuts tight to prevent excessive vibration during the spin cycles. Also be sure to leave a minimum of 1/2" (12 mm) of space between the washer and the dryer.

The height adjustment for the washer is 33-1/2" to 34-1/2" (850 mm to 876 mm). Do not raise it higher than 34-1/2".

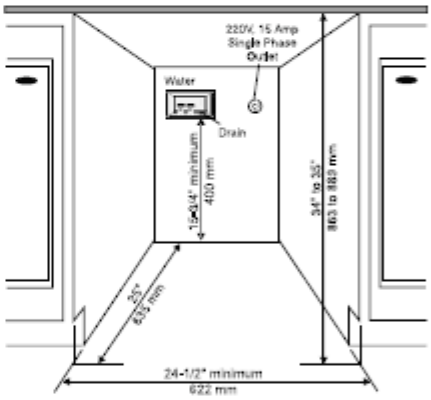
STACKED INSTALLATION

ASKO washers should never be stacked on a counter or a dryer. You can, however, stack an ASKO dryer on an ASKO washer. Refer to your *Dryer Use and Care Guide* for instructions on how to do this.

BUILT-IN INSTALLATION

ASKO washers can be installed beneath a cabinet or worktop with a height of 34-1/2" (876 mm). There must be a gap of about 1/2" (12 mm) all around the machine, including between the rear edge of the machine top panel and the back wall. The opening width must be at least 24-1/2" (622 mm).

Space must also be available for the inlet and drain hoses. See the diagram below for measurements and positions.



If the drain outlet is higher than 24", the connections will need to be recessed.

PRODUCT WARRANTY

MODELS W6021, W6461

Be sure to complete the Warranty Registration Card you received with your appliance and mail it to AM Appliance Group to validate your appliance warranty.

Cosmetic damage must be reported to your dealer within five days from the date of purchase. After unpacking the washer, thoroughly check the unit for cosmetic damage.

FOR RESIDENTIAL INSTALLATIONS ONLY

LENGTH OF WARRANTY	*AM APPLIANCE GROUP WILL PAY FOR:*
Three-Year Full From date of purchase.	ASKO replacement parts and/or repair labor to correct defect in materials or workmanship. Service must be provided by an authorized ASKO service agent.
Fourth & Fifth Year Limited Three year full plus fourth and fifth year limited from date of purchase.	ASKO replacement parts (labor cost not included) for any defective solid-state controls, timers, motors, or pumps. Service must be provided by an authorized ASKO service agent.
Lifetime	ASKO replacement parts (labor cost not included) of the stainless steel tank if it fails to hold water due to a manufacturing defect, such as rusting or cracking. Service must be provided by an authorized ASKO service agent.

FOR NON-RESIDENTIAL INSTALLATIONS

Six-Month Full Warranty From date of purchase.	ASKO replacement parts and/or repair labor to correct defect in materials or workmanship. Service must be provided by an authorized ASKO service agent.

AM APPLIANCE GROUP WILL NOT PAY FOR:

A. Service calls to:
   1. Correct the installation of the appliance.
   2. Repair damage due to shipment, delivery, installation, misuse or abuse.
   3. Instruct how to use the appliance.
   4. Replace house fuses or correct house wiring.
   5. Correct house plumbing, including drainage problems related to improper installation.
   6. Clean or service air device in drain line.

B. Repair and/or replacement parts for failure of product if appliance is used for other than home/residential use.

C. Damage resulting from accident, fire, floods, acts of God, alteration, misuse, abuse, improper installation, or installation not in accordance with local electrical or plumbing codes.

D. Any shipping costs for parts during the limited warranty period.

E. Replacement parts or repair labor costs for units operated outside the continental United States.

F. Pickup and delivery. ASKO washers are designed to be repaired in the home.

IN NO EVENT SHALL AM APPLIANCE GROUP BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Some states will not allow the exclusion or limitation of incidental or consequential damages, so this exclusion or limitation may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

For warranty service, contact the dealer from whom you purchased the unit or an authorized ASKO service agent. Service will be provided during normal business hours. Should you have a service problem that cannot be resolved locally, contact AM Appliance Group at the numbers listed below. Before calling for service or contacting AM Appliance Group regarding a warranty issue, make a note of the model, type name, and serial number (see page 23).

Write to us at:
AM Appliance Group
P. O. Box 851805
Richardson, Texas 75085-1805
www.askousa.com

Or call our
ASKO Advisory Center a
Division of AM Appliance Group at
800-898-1879 or
972-238-0794

3.2 DRYER

IMPORTANT SAFETY INSTRUCTIONS

WARNING!
To reduce the risk of fire, electric shock, or injury to persons when using your appliance, follow basic precautions, including the following:

- Read all instructions before using the appliance.
- Do not wash or dry articles that have been previously cleaned in, washed in, soaked in, or spotted with gasoline, dry-cleaning solvents, cooking oils, other flammable or explosive substances as they give off vapors that could ignite or explode.
- Do not allow children to play on or in the appliance. Children should be closely supervised when near the appliance.
- Before the appliance is removed from service or discarded, remove the door to the drying compartment.
- Do not reach into the appliance if the drum is moving.
- Do not install or store this appliance where it will be exposed to the weather.
- Do not tamper with controls.
- Do not attempt to repair or replace any part of the appliance or perform any servicing unless specifically recommended in this guide.
- Do not use fabric softeners or dryer sheets unless the manufacturer gives written assurance that the product will not damage a tumble dryer.
- Do not heat-dry items containing:
  - vinyl, plastic, foam rubber or similarly textured rubberlike materials
  - fiberglass
  - wool unless the label specifies "washable"
- Clean the lint filter before or after each load.
- Keep the area around the exhaust opening and adjacent surrounding areas free from the accumulation of lint, dust and dirt.
- The interior of the machine should be cleaned periodically by an authorized ASKO service agent.
- Do not place items exposed to cooking oils in your dryer. Items contaminated with cooking oils may contribute to a chemical reaction that could cause a load to catch fire.
- Electrical installation, if required, must be done by a licensed electrician.
- Do not operate appliance while away from the home.
- Do not heat dry items that have been dry-cleaned.
- The dryer is made and marked to facilitate recycling. When it is no longer useful, contact your local refuse collection service for advice on how to properly dispose of the dryer for purposes of recycling.

WARNING!
This appliance must be properly grounded.

GROUNDING INSTRUCTIONS

A) Grounding instructions for a grounded, cord-connected appliance

In the event of malfunction or breakdown, grounding will reduce the risk of electric shock by providing a path of least resistance for electric current. This appliance is equipped with a cord having an equipment-grounding conductor and a grounding plug. The plug must be plugged into an appropriate outlet that is properly installed and grounded in accordance with all local codes and ordinances.

To reduce the risk of fire, this appliance must be exhausted outdoors or the equivalent. Do not exhaust into a chimney, wall, ceiling or concealed space in a building.

WARNING!
Improper connection of the equipment-grounding conductor can result in a risk of electric shock. Check with a qualified electrician or service representative or personnel if you are in doubt as to whether the appliance is properly grounded.

Do not modify the plug provided with the appliance. If it will not fit the outlet, have a proper outlet installed by a qualified electrician.

B) Grounding instructions for a permanently connected appliance:

This appliance must be connected to a grounded metal, permanent wiring system, or an equipment-grounding terminal or lead on the appliance.

NOTE: This manual does not cover every possible condition and situation that may occur. Use common sense and caution when installing, operating, and maintaining any appliance.

INSTALLATION INSTRUCTIONS

Read these instructions carefully and completely before you install the machine. The installation should be carried out by a qualified person who is familiar with all local codes and ordinances for electrical and plumbing connections.

NOTE: Cosmetic damage must be reported to your dealer within five days from the date of purchase. After unpacking the dryer, thoroughly check the unit for cosmetic damage.

SPECIFICATIONS

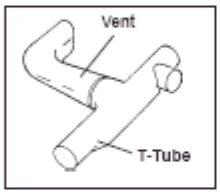
Height	33-1/2"–34-1/2 (850–876 mm)
Width	23-7/16" (595 mm) Plus exhaust hose connection
Depth	T761/T781: 23-7/16" (595 mm) T711/T721/T731: 24-7/16" (620 mm)
Weight	86 lbs (39 kg)
Drum material	Stainless Steel
Outer casing	Stove-enamelled hot-dipped galvanized steel
Power requirement	2800 watts (T711: 3300 watts)
For connection	Single-phase, 230 V, 30 Amp
Internal fuse	15 amp. (T711: no fuses)
Heating element	2500 watts (T711: 3000 watts)

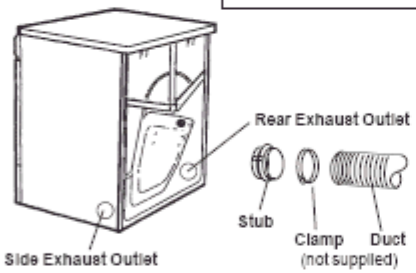
CONNECTING THE EXHAUST DUCT TO THE DRYER (T711/T731/T761)

NOTE: You will need to purchase a UL-CSA-approved 4-inch ridged metal exhaust duct.

The dryer is delivered with the stub pipe attached to the rear exhaust outlet, but the exhaust duct can be attached to either the right or left exhaust outlet.

ASKO dryers have a "T-style" exhaust vent that allows you to connect the duct on the rear or on the left or right side.





CONNECTING THE EXHAUST DUCT TO THE REAR OUTLET

To connect the exhaust duct to the rear outlet, follow the steps below:

1. Push the duct onto the stub pipe and secure it with a clamp.
2. With the duct attached, insert the stub pipe into the hole. It should snap into place.
3. After you push the dryer into place, check for kinks in the duct.

NOTE: Excessive duct length and too many bends can impede drying performance. We recommend that you cut off any excess exhaust duct and run the duct with as few bends as possible. Make any necessary bends as gentle as possible.

NOTE: Maximum duct length of 22 feet is allowed. Subtract 4 feet of duct for each 90° elbow.

CONNECTING THE EXHAUST DUCT TO THE LEFT OR RIGHT SIDE OUTLET

To connect the exhaust duct to the left or right side outlet, follow the steps below:

1. Using a flathead screw-driver, turn the exhaust outlet cover you plan to use to the right or left to align the tabs holding the cover in place.
2. Remove the exhaust outlet cover.
3. Remove the stub pipe from the rear exhaust outlet and place it in the outlet you plan to use.
4. Push the duct onto the stub pipe and secure it with a clamp.
5. With the duct attached, insert the stub pipe into the hole. It should snap into place.
6. After you push the dryer into place, check for kinks in the duct.
7. Use the exhaust outlet cover you removed from the to cover the rear exhaust outlet.

WARNING!
To reduce the risk of fire, this appliance must be exhausted OUTDOORS or the equivalent.

Never cover the end of the dryer stub or exhaust duct with anything to catch lint, except for UL approved vent basket.

CONNECTING TO A VENTILATION DUCT (T711/T731/T761)

You will need a UL-CSA-approved, 4-inch ridged metal exhaust duct.

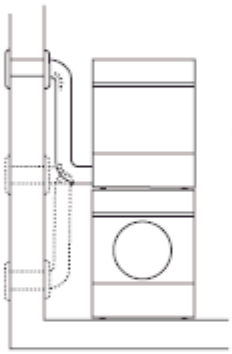
NOTE: The more bends and the longer the duct, the less air will circulate through the machine, which will impede drying performance. We recommend that you cut off any excess exhaust duct and run the duct with as few bends as possible. And make any necessary bends as gentle as possible.

NOTE: Maximum duct length of 22 feet is allowed. Subtract 4 feet of duct for each 90° elbow.

If more than 20 feet of duct is needed, the diameter must be increased to 6" or 8" (152 mm or 203 mm).

NOTE: When installing in warm climates (77° F and above) with high humidity levels, do not route the air exhaust duct upwards.

Installation Examples

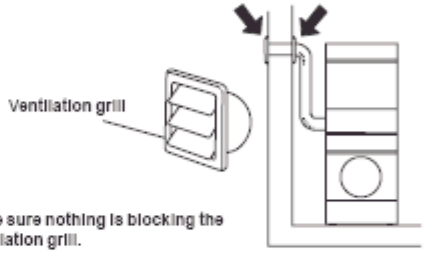


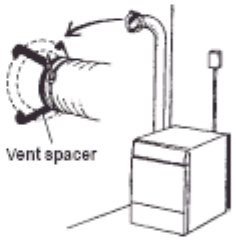
To connect the exhaust duct to a ventilation outlet, follow the steps below:

1. Connect the exhaust duct to a ventilation exhaust fitting or to a discharge through the wall.
2. Secure the duct joint to the outlet stub on the machine.
3. Run the duct with as few bends as possible to the point of discharge.

WARNING!
This appliance should not be exhausted into a chimney, a wall, a ceiling, or a concealed space of a building. Only a metal ventilation grill should be used.

If the duct is taken to a wall outlet, a ventilation grill should be fitted to prevent reverse flow of cold air. Fit the ventilation grill to the outside or inside of the wall.



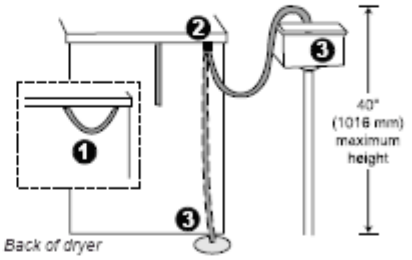


CONDENSATION DRAIN CONNECTION (T721 AND T781)

Install the dryer so the condensed water will continuously flow into a drain or sink. To do this, follow the instructions below:

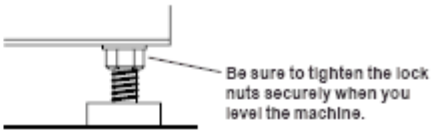
1. Disconnect the short hose (1) from the blue connection. (It's okay to let the hose hang down.)
2. Connect the rubber hose supplied with the dryer to the blue nipple (2).
3. Run the hose to a drain or sink, as illustrated.

NOTE: The drain hose must not be more than 40" above the floor.



LEVELING THE MACHINE

It is important that the machine is level. Each foot on the dryer is adjustable, so you can level the unit on any surface. Once it is level, securely tighten the lock nuts on the feet.



FREESTANDING INSTALLATION

The dryer can be placed next to the washing machine.

It is essential that the machine is leveled and the locknuts are tight to eliminate vibration noise.

There should be at least 1/2" (12 mm) of space between the washer and dryer.

BUILT-IN INSTALLATION

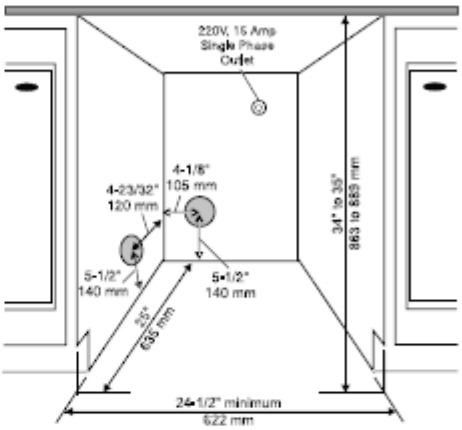
ASKO dryers can be installed beneath a cabinet or worktop with a minimum height of 34" (864 mm). There must be a gap of about 1/2" (12 mm) all around the machine, including between the rear edge of the machine top panel and the back wall. The opening width must be at least 24-1/2" (622 mm).

Space must also be available for the exhaust hose on the left, right or rear of the machine. See the diagram for hole sizes and positions. Note that the hole measurements are to the center of the hole.

CONDENSING DRYERS (T721/T781)

The condensing models work best when they have good air circulation. Therefore, we don't recommend they be installed beneath a cabinet. If it is necessary, however, be sure to leave a gap of at least 1/2" (12 mm) on all sides.

Install the dryer so the condensed water will continuously flow into a drain or sink, you will need a drain outlet behind the unit. The maximum drain height is 40" (1016 mm). (See page 4.)



NOTES: The height adjustment for the dryer is 33-1/2" to 34-1/2" (850 mm to 876 mm). Do not raise it higher than 34-1/2".

Hole measurements are from center of hole.

ELECTRICAL CONNECTIONS

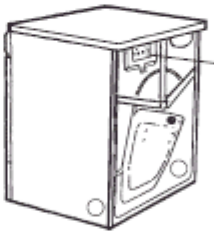
WARNING!
This appliance must be properly grounded. Refer to the "Important Safety Instructions" on page 2 for grounding instructions.

The power supply cord must be grounded. If the machine is to be used in a wet area, the supply must be protected by a residual current device.

Connection to a permanently wired supply point must be made only by a qualified electrician.

As supplied: Single-phase, 230 V, 60 Hz,
2500 Watt heater rating (T711: 3000 W)
30 A fuse required

> *WARNING:*
> **The receptacle on the rear of the machine is designed to accommodate ASKO washers *ONLY* (rated 208–240 V.) To use this receptacle, you must use the ready-fitted plug supplied with the washing machine or an equivalent.**
>
> **ASKO washers rated 208–240 V have two internal fuses of 15 A each.**



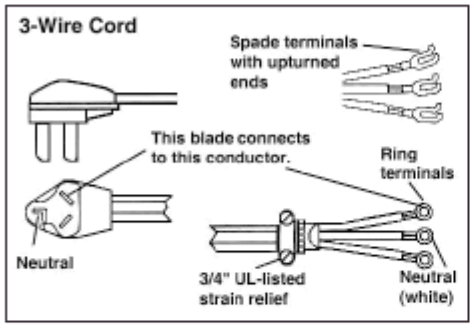
NOTE: In Canada, the dryer is delivered ready-fitted with a four-prong plug intended for connection to a single-phase supply.

CONNECTING A 3-WIRE POWER CORD

WARNING!
Before starting this procedure, be sure the power is turned off at the breaker/fuse box.

Power Supply Cord

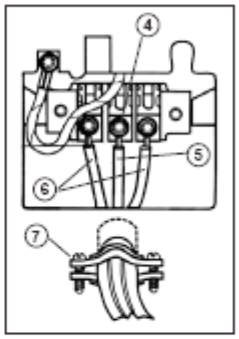
You will need a 3-wire power supply cord with three No. 10 copper wires and a matching 3-wire receptacle of NEMA Type 10-30R, as illustrated below:



To connect a 3-wire power cord to the dryer, follow the steps below.

NOTE: The numbers in the illustration below correlate to the step numbers.

1. Turn the power off at the breaker/fuse box.
2. Remove terminal block cover.
3. Use the strain relief attached below the terminal block opening.
4. Loosen or remove center terminal block screw.
5. Connect neutral (white) wire of power supply cord to the center, silver-colored terminal screw. Tighten screw.
6. Connect the other wires to outer screws.
7. Tighten the strain relief screws.
8. Replace terminal box cover on back of dryer.
9. Plug dryer into wall receptacle.
10. Turn power on at breaker/fuse box.

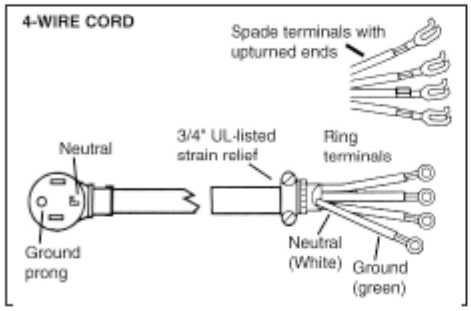


CONNECTING A 4-WIRE POWER CORD

WARNING!
Before starting this procedure, be sure the power is turned off at the breaker/fuse box.

Power Supply Cord

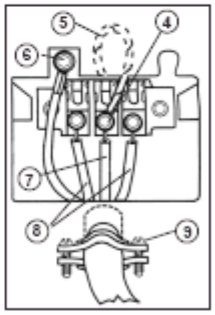
You will need a 4-wire power supply cord with four No. 10 copper wires and a matching 4-wire receptacle of NEMA Type 14-30R, as illustrated below. The fourth wire must be identified with a green cover and the neutral conductor by a white cover.



To connect a 3-wire power cord to the dryer, follow the steps below.

NOTE: The numbers in the illustration below correlate to the step numbers.

1. Turn the power off at the breaker/fuse box.
2. Remove terminal block cover.
3. Use the strain relief attached below the terminal block opening.
4. Remove center terminal block screw.
5. Remove ground wire (green with yellow stripes) from external ground connector screw. Fasten under center, silver-colored terminal block screw.
6. Connect ground (green) wire of cord to external ground conductor screw.
7. Connect neutral (white) wire of cord under center screw of terminal block.
8. Connect the other wires to outer screws.
9. Tighten the strain relief screws.
10. Replace terminal box cover on back of dryer.
11. Plug dryer into wall receptacle.
12. Turn power on at breaker/fuse box.



STACKED INSTALLATION

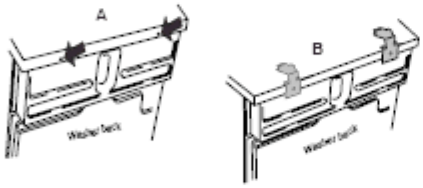
ASKO dryers can be mounted on top of any matching ASKO washer. Mounts are supplied with the machine. The metal brackets are attached to the lower back of the unit. The plastic cups are packed inside the dryer.

Two metal brackets for securing the dryer to the washer

Two plastic cups to secure the dryer legs.

To install the dryer on top of the washer, follow the steps below:

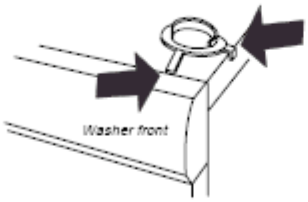
1. Remove the two outside screws (A) (20 torx) from the back of the washer and use them to secure the metal brackets (B), as illustrated below.



2. To ensure the dryer is correctly positioned on top of the washer, you will need to align the plastic cups with the front top edge of the washer. To position the plastic cups, break off the left tab on the cup to be placed on the right side of the washer and break off the right tab on the cup to be placed on the left side of the washer.

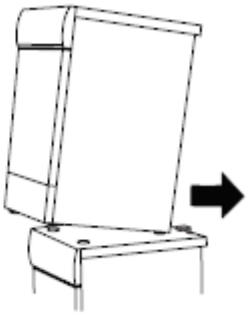
Plastic cups

3. Remove the protective paper from the self-adhesive surface beneath the cups. Being careful not to press the adhesive surface against the top of the washing machine, use the tabs to position the cups (as illustrated below) then press them firmly into place.

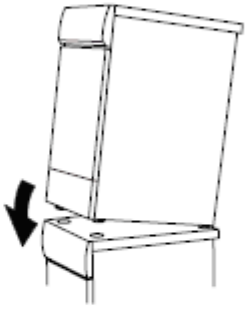


4. Once the cups are correctly in place, break off the remaining plastic tabs.

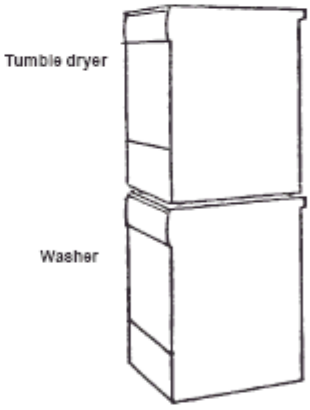
5. Lift the dryer into position. Raising the front edge, push the dryer backwards until it engages with the brackets on the back of the washer.



6. Carefully lower the front of the dryer, making sure the feet fit into the plastic cups.



Stacked Installation



Total height 67".
Adjustable to 69".

WARNING!
Never stack a washer on top of a dryer!

CARE AND MAINTENANCE INSTRUCTIONS

CLEANING THE LINT FILTER

The wear on fabrics in a tumble dryer is insignificant. The lint caught in the lint filter is dust and fiber residue that has been formed when the garments have been worn. The lint filter must be cleaned after *each* load. If this is not done, drying performance will suffer, as insufficient air will pass through the drum. The machine may also overheat after a while, which will cause it to stop automatically.

To clean the lint filter, follow the steps below:

1. Grasp the handle and pull it toward you.
2. Remove the filter from the holder.
3. Open the filter and gently brush away any lint.
4. Fold the filter together and return it to the holder on the door.
5. Push the holder in until it snaps into place.

NOTE: If you use dryer sheets (not recommended), you may occasionally need to wash the lint filter with warm water and a soft brush to clean any blocked holes.

CLEANING THE CONTROL PANEL

To clean the control panel, use only a soft, warm, damp (not wet) cloth. To prevent penetration of water into the door lock and electrical components, **never spray water or cleaning solvent of any kind on the control panel**.

Also, never use abrasive cleaners or scouring pads on the outer surfaces because they will scratch the finish and possibly remove the writing on the control panels. Some paper towels may also scratch the finish.

CLEANING THE EXHAUST HOSE– T711, T731, AND T761 ONLY

About once a year you should remove the exhaust hose and clean it. At this time, you should also clean the exhaust outlet on the machine and the ventilation duct.

Periodically, you should check the dryer exhaust outside to be sure the air flow is strong and nothing is blocking the vent.

ASKO PRODUCT WARRANTY

MODELS T711, T721, T731, T761, T781

Be sure to complete the Warranty Registration Card you received with your appliance and mail it to AM Appliance Group to validate your appliance warranty.

Cosmetic damage must be reported to your dealer within five days from the date of purchase. After unpacking the dryer, thoroughly check the unit for cosmetic damage.

FOR RESIDENTIAL INSTALLATIONS ONLY

LENGTH OF WARRANTY	*AM APPLIANCE GROUP WILL PAY FOR:*
Three-Year Full From date of purchase.	ASKO replacement parts and/or repair labor to correct defect in materials or workmanship. Service must be provided by an authorized ASKO service agent.
Fourth & Fifth Year Limited Three year full plus fourth and fifth year limited from date of purchase.	ASKO replacement parts (labor cost not included) for any defective solid-state controls, timers, motors, or pumps. Service must be provided by an authorized ASKO service agent.
Lifetime	ASKO replacement parts (labor cost not included) of the stainless steel drum if it fails to hold water due to a manufacturing defect, such as rusting or cracking. Service must be provided by an authorized ASKO service agent.

FOR NON-RESIDENTIAL INSTALLATIONS

Six-Month Full Warranty From date of purchase.	ASKO replacement parts and/or repair labor to correct defect in materials or workmanship. Service must be provided by an authorized ASKO service agent.

AM APPLIANCE GROUP WILL NOT PAY FOR:

A. Service calls to:
   1. Correct the installation of the appliance.
   2. Repair damage due to shipment, delivery, installation, misuse or abuse.
   3. Instruct how to use the appliance.
   4. Replace house fuses or correct house wiring.
   5. Correct house plumbing, including drainage problems related to improper installation.
   6. Clean or service air device in drain line.

B. Repair and/or replacement parts for failure of product if appliance is used for other than home/residential use.

C. Damage resulting from accident, fire, floods, acts of God, alteration, misuse, abuse, improper installation, or installation not in accordance with local electrical or plumbing codes.

D. Any shipping costs for parts during the limited warranty period.

E. Replacement parts or repair labor costs for units operated outside the Continental United States.

F. Pickup and delivery. ASKO washers are designed to be repaired in the home.

IN NO EVENT SHALL AM APPLIANCE GROUP BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Some states will not allow the exclusion or limitation of incidental or consequential damages, so this exclusion or limitation may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

For warranty service, contact the dealer from whom you purchased the unit or an authorized ASKO service agent. Service will be provided during normal business hours. Should you have a service problem that can not be resolved locally, contact AM Appliance Group at the numbers listed below. Before calling for service or contacting AM Appliance Group regarding a warranty issue, make a note of the model, type name, and serial number (see page 24).

Write to us at:
AM Appliance Group
P. O. Box 851805
Richardson, Texas 75085-1805
www.askousa.com

Or call our
ASKO Advisory Center a
Division of AM Appliance Group at
800-898-1879 or
972-238-0794

REVERSING THE DOOR HINGES

The door hinges on ASKO dryers are reversible. The dryers are shipped left-hinged. To reverse them, follow the steps below:

WARNING! **Switch off the main power supply before you start this procedure.**

1. Remove the two 20 torx screws on the bottom of the bottom panel then grasp the bottom of the panel and pull it forward and down.

2. Remove the bottom hinge bracket by removing the three screws holding the bracket in place.

3. Supporting the door from the bottom, pull it out and to the left as you turn the hinge bracket counter-clockwise.

4. Remove the hinge pin at the top of the hing bracket.
5. Turn the hinge bracket upside down and put the hinge pin into the top hole.

6. Transfer the top hinge pin to the right side of the dryer casing.

7. Loosen the two screws on both outer edges of the door so you can remove the magnetic door catch and the cover plate.

8. Remove the magnetic catch by pushing it up then lifting it out from the bottom.

9. Remove the cover plate on the opposite side of the door by pushing it down then lifting it out from the top.

10. Reverse steps 8 and 9 to place the door catch and cover plate into their new positions.

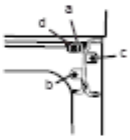
11. Tighten the screws on the sides of the doors to hold the magnetic catch and cover plate in place.

12. Using a flathead screwdriver, carefully remove the plastic plugs in the upper and lower edge of the door and place them in the empty holes on the opposite side.

13. Remove the screw in the top right corner of the bottom panel. (If you have a condenser dryer, you will have to open the condenser unit door.)

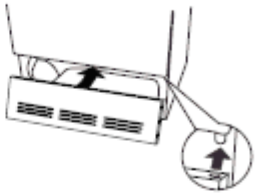
14. Now you are ready to mount the door on the right side. Holding the door at an angle (as illustrated), fit the hinge pin into the top hole.

15. Position the bottom hinge bracket and secure it with the screws in the order illustrated at right (a, b, c).



16. Replace the screw you removed in step 13 (d).

17. Replace the lower panel.



18. Turn back on the main power.

3.5 COOKTOP

A. Refer to the illustrations and specifications for overall dimensions, cut-out dimensions and installation specifics.
B. Wolf recommends using 33" (838) wide cabinets for installation of two 15" (381) modules side by side. An 18" (457) wide cabinet is recommended for installation of a single 15" (381) cooktop or module.
C. IMPORTANT NOTE: Review specific installation instructions for product to product capabilities
D. If the 15" (381) integrated induction cooktop is to be used with any combination of additional cooktop units or modules with a filler strip, the cut-out width increases to 14" (356). When multiple cooktops or modules are installed side by side, refer to the countertop cut-out dimensions on page 6.
E. IMPORTANT NOTE: A minimum height clearance of 6" (152) is required. If a shelf is installed below the unit, a 1" (25) gap at the rear of the cabinet shelf is necessary to allow for proper ventilation. Failure to do so could result in decreased performance or product damage. A Wolf downdraft system, Cooktop or Pro ventilation hood is recommended. When installing a ventilation hood, refer to the specific requirements of the hood for the minimum dimension to countertop. Also refer to Ventilation Recommendations in the Cooktop Ventilation or Pro Ventilation sections of our website, wolfappliance.com.
F. The Wolf 15" (381) integrated induction cooktop requires a separate, grounded 3-wire 240/208 V AC, 60 Hz, 20 amp service with its own circuit breaker. It has a 4' (1.2 m) flexible 3-wire conduit for connection at the electrical supply. Locate electrical within the shaded area shown in the Installation illustration on page 4.
G. You must follow all National Electrical Code regulations. In addition, be aware of local codes and ordinances when installing your service.
H. Refer to the installation instructions shipped with each Wolf product for detailed specifications.
I. INTEGRATED MODULES – MULTIPLE INSTALLATION
   1. With Wolf's integrated modules, you have the ultimate in customization. You can create your own design by mixing and matching the various components within this system. And when you couple these modules with other cooktops within the Wolf inventory you and your client will truly understand freedom of choice.
   2. Some Wolf integrated modules can be installed together or with a 30" (762) or 36" (914) cooktop. When multiple units are installed side by side, the cut-out dimensions that are shown in the illustration are derived by adding 11/4" (32) additional space for each additional unit, to give you your total cut-out width. Refer to the illustration below for countertop cut-out dimensions for installation of multiple cooktops.
   3. IMPORTANT NOTE: Refer to the pages for each specific integrated module for installation limitations.
   4. IMPORTANT NOTE: Where multiple cooktops and/or modules are installed side by side, each unit must have its own separate recommended electrical circuit. When multiple gas cooktops and/or modules are installed next to one another, they can receive their gas supply from a common line. However, each unit must have its own regulator installed between the mainline and the cooktop or module.
   5. When two or more cooktops or modules are installed together, an integrated module filler strip is recommended. Contact your Wolf dealer for information on this accessory component.
   6. For electrical requirements, additional specifications and installation limitations, refer to the Installation Notes on page 5.
   7. IMPORTANT NOTE: Review specific installation instructions for product to product capabilities.
J. INSTALLATION REQUIREMENTS
   1. IMPORTANT NOTE: Save these Installation Instructions for the local inspector’s use.
   2. Please read the entire Installation Instructions prior to installation.
   3. This installation must be completed by a qualified technician.
   4. Installer: please retain these instructions for local inspector’s reference, then leave them with the homeowner.
   5. Homeowner: please read and keep these instructions for future reference and be sure to read the entire Use & Care Information prior to use.

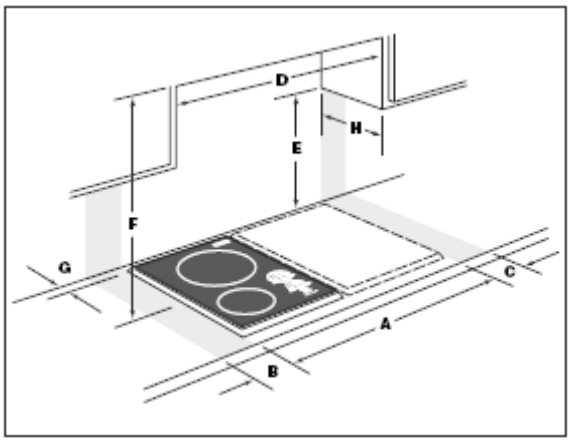
6. IMPORTANT NOTE: This appliance must be installed in accordance with National Electrical Codes, as well as all state, municipal and local codes. The correct voltage, frequency and amperage must be supplied to the appliance from a dedicated, grounded circuit which is protected by a properly sized circuit breaker or time delay fuse. The propervoltage, frequency, and amperage ratings are listed on the model/ serial rating plate.
7. Record the model and serial numbers before installing the cooktop. Both numbers are on the model/ serial rating plate, located on the underside of the cooktop

K. BEFORE YOU START

1. Proper installation is your responsibility. Have a qualified technician install this cooktop. You must also assure that electrical installation is adequate and in compliance with all local codes and ordinances.
2. Installations and repairs must be performed by a qualified or licensed contractor or electrician qualified or licensed by the state, province, or region where this appliance is being installed.
3. Make sure you have everything necessary for correct installation. It is the responsibility of the installer to comply with the installation clearances specified on the model/ serial rating plate. The model/serial rating plate can be found on the underside of the cooktop.
4. Electrical ground is required, see Electrical Requirements on page 8.
5. When installing a cooktop under existing cabinets and the installation does not meet the minimum cabinet clearances, install a Wolf ventilation hood above the cooktop to avoid burn hazards.

L. SITE PREPARATION

1. **IMPORTANT NOTE:** Installation of the Wolf induction cooktop must meet the following location requirements. All dimensions listed are minimum requirements for safe operation.



Minimum clearances for installation

2. LOCATION IN COUNTERTOP
1. Minimum flat countertop surface. Must be equal to or greater than cooktop width.
2. Minimum 2" (51) wide clearance from the cooktop side edge to any combustible surface up to 18" (457) above the cooktop (noted by shaded area).
3. Minimum 2" (51) wide clearance from the cooktop side edge to any combustible surface up to 18" (457) above the cooktop (noted by shaded area).

M. OVERHEAD CABINET DIMENSIONS

1. Minimum spacing between cabinets directly over cooktop must be greater than or equal to the nominal width of the cooktop unit(s).
2. Minimum 18" (457) vertical distance from the countertop surface to the bottom of cabinets adjacent to the cabinet directly above the cooktop unit.
3. Minimum 24" (610) clearance between top of cooking surface and bottom of wood or metal cabinet which is protected by not less than 1/4" (6) flame retardant millboard covered with not less than No. 28 MSG sheet steel, .015" (.4) stainless steel, or .024" (.6) aluminum or .02" (.5) copper. Minimum

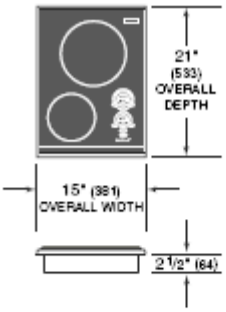
30" (762) clearance between the top of the cooking surface and the bottom of an unprotected wood or metal cabinet.

4. Minimum 0" (0) from rear wall.
5. Maximum 13" (330) depth of overhead cabinets.
6. IMPORTANT NOTE: A minimum height clearance of 6" (152) is required. If a shelf is installed below the unit, a 1" (25) gap at the rear of the cabinet shelf is necessary to allow for proper ventilation. Failure to do so could result in decreased performance or product damage.

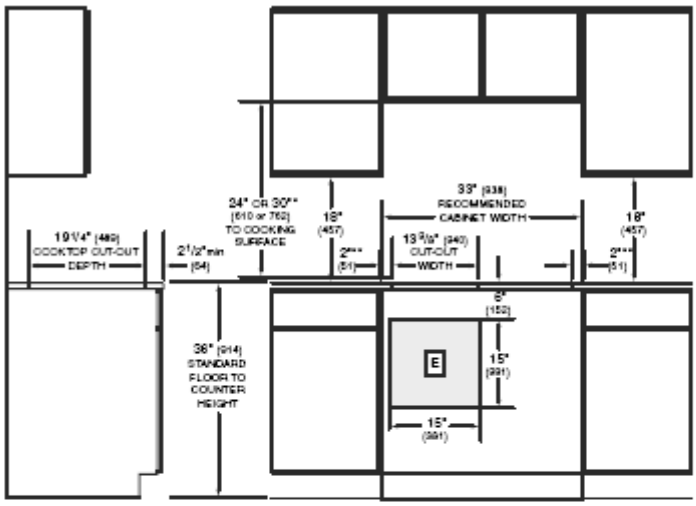
MODEL CT151/S DIMENSIONS

Overall Width	15" (381)
Overall Height	2 1/2" (64)
Overall Depth	21" (533)
Minimum Cabinet Depth	22 3/4" (578)
Minimum Height Clearance	6" (152)
Cut-Out Width*	13 3/8" (340)
Cut-Out Depth	19 1/4" (489)

If the induction cooktop is to be used with any combination of additional cooktops or modules with a filler strip, the cut-out width increases to 14" (356).

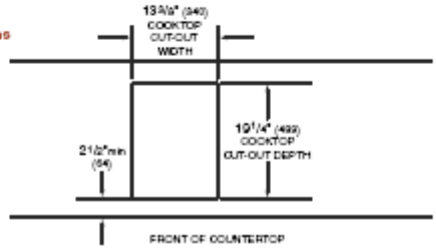


Overall Dimensions



NOTE: Application shown allows for installation of two 15" (381) modules side-by-side.
*Minimum 24" (610) from protected cabinet or 30" (762) from unprotected cabinet to cooking surface.
**Minimum clearance from side edge of cooktop cut-out to combustible surface up to 18" (457) above cooking surface.

Installation Specifications and Countertop Cut-Out Dimensions



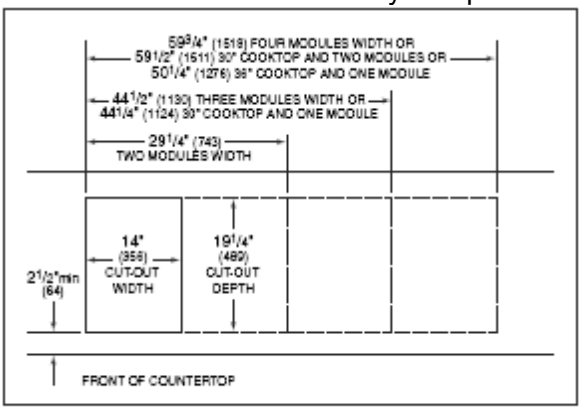
Dimensions in parentheses are in millimeters unless otherwise specified.

N. COUNTERTOP CUT-OUT

1. The induction cooktop is designed to fit a standard 24" (610) deep base cabinet with 25" (635) deep countertop. Before making the cooktop cut-out, verify that the cooktop will clear the side walls of the base cabinet below. There should be at least 51/2" (140) clearance between the top countertop surface and any combustible surface directly below the unit. This includes upper edges of drawers located directly below unit.
2. IMPORTANT NOTE: When multiple cooktops and/or modules are installed side by side, refer to the illustration below for countertop cut-out dimensions.

3. IMPORTANT NOTE: Plastic or other utensils with low melting temperatures should not be located in drawers directly below unit.

O. MULTIPLE COOKTOP INSTALLATION
1. IMPORTANT NOTE: If the induction cooktop is to be used with any combination of additional cooktop units or modules with a filler strip, the cut-out width is calculated by adding the corresponding units' cut-out dimensions plus 11/4" (32) for each additional unit.
2. If multiple modules are to be installed, the cutout width of the induction cooktop should be increased from 133/8" (340) to 14" (356). Refer to the illustration below.
3. IMPORTANT NOTE: Where multiple units are installed side by side, each unit must have its own separate recommended electrical circuit.
4. IMPORTANT NOTE: When two or more modules are installed together, an integrated module filler strip (IFILLER/S) is required. If a downdraft ventilation system is also installed, an integrated module support for downdraft ventilation (ISUPPORT) is required. Contact your Wolf dealer for information on these accessory components.



Countertop cut-out dimensions for installation of multiple cooktops

P. VENTILATION OPTIONS
1. IMPORTANT NOTE: It is recommended that you operate the Wolf induction cooktop with either a Wolf cooktop hood, downdraft system or Pro ventilation hood. Contact your Wolf dealer for details.
2. Cooktop Wall Hood – 30" (762) or 36" (914) widths in classic stainless steel.
3. Cooktop Island Hood – 42" (1067) width in classic stainless steel.
4. Downdraft Ventilation System – 30" (762) or 36" (914) widths, with top cover and control panel in classic, platinum or carbon stainless steel finishes (adequate countertop depth is required).
5. Pro Wall Hood – 22" (559), 24" (610) or 27" (686) depths and 30" (762) to 66" (1676) widths in classic stainless steel.
6. Pro Island Hood – 36" (914) to 66" (1676) widths in classic stainless steel.
7. Pro Hood Liner – available in widths to accommodate 30" (762) to 60" (1524) hood shells.
8. All hoods have welded seams, sealed halogen lighting and removable dishwasher safe stainless steel filters.
9. Blower requirements may vary due to the length of ducting and number of angles. The basic recommendations is 100–150 net cfm's per square foot of cooking area. Always consult your HVAC professional for more concise blower requirements.
10. IMPORTANT NOTE: When installing a ventilation hood, refer to the specific requirements of the hood for the minimum dimension to cooking surface.

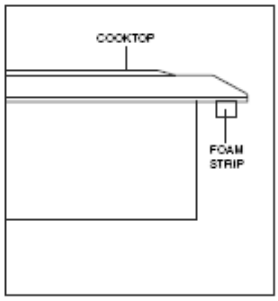
Q. ELECTRICAL REQUIREMENTS
1. Required Power Supply 240 V AC / 18 amp / 60 Hz – 20 amp service
2. Maximum Connected Load 3.6 Kw at 240 V AC
3. Operating Voltage Range 207 V AC – 250 V AC
4. The Wolf induction cooktop requires a separate, grounded 3-wire service with its own circuit breaker. Locate electrical within the shaded area shown in the Installation Specifications illustration on page 5.
5. This appliance must be installed in accordance with National Electrical Codes, as well as all state, municipal and local codes. The correct voltage, frequency and amperage must be supplied to the

appliance from a dedicated, grounded circuit which is protected by a properly sized circuit breaker or time delay fuse. The proper voltage, frequency and amperage ratings are listed on the product model/ serial rating plate, located on the underside of the cooktop.

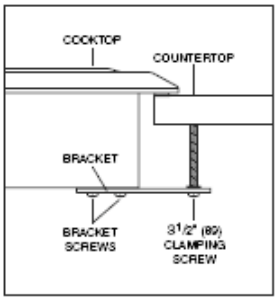
6. The cooktop is provided with a 4' (1.2 m) conduit consisting of two insulated hot lead conductors (copper) and one insulated ground conductor (copper).
7. For Electrical Installation – attach the conductors to the residence wiring in accordance with National Electrical Codes and all state, provincial, municipal and local codes.

R. COOKTOP INSTALLATION

1. Locating unit in countertop
   a. Attach the foam strip to the underside of the cooktop frame. Refer to the illustration below.
   b. Gently lower the unit into the cut-out area in the countertop and center. Check that the front edge of cooktop is parallel to the front edge of the countertop. Check that all required clearances are met.
   c. Attach the brackets to the bottom of the unit, as shown in the illustration below. Install the clamping screws into the bracket and tighten until screws contact the underside of the counter top. **Do not overtighten screws.**
   d. **IMPORTANT NOTE:** Do not use caulk or silicone to seal the unit to the countertop. The unit must be readily removable for service.



Foam strip



Installation brackets

S. CLEANING AND MAINTENANCE

1. TO REMOV E THE COOKTOP
2. IMPORTANT NOTE: This procedure should only be performed by a Wolf Factory Authorized Service Center technician.
3. If removing the cooktop is necessary for cleaning or maintenance, disconnect the electric supply. Remove the mounting brackets on the right and left side of the unit. After disconnecting the electric supply, finish removing the cooktop for cleaning and servicing. Reinstall in the reverse order.

T. WARNINGS

   a. This cooktop is intended for indoors use.
   b. To eliminate the risk of burns or fire by reaching over heated surface units, cabinet storage space located above the surface units should be avoided. If cabinet storage is to be provided, the risk can be reduced by installing a ventilation hood that protects horizontally a minimum of 5" (127) beyond the bottom of the cabinets.
   c. Failure to locate the cooktop unit without the proper clearances will result in a fire hazard.
   d. Verify that power is disconnected from the junction box before proceeding.
   e. The complete appliance must be properly grounded at all times when electrical power is applied.
   f. Do not ground the appliance with the neutral (white) house supply wire. A separate ground wire must be utilized.
   g. If aluminum house supply wiring is utilized, splice the appliance copper wire to the aluminum house wiring using special connectors designed and agency certified for joining copper and aluminum. Follow the connector manufacturer's recommended procedure carefully. Improper connection can result in a fire hazard!

h. If the cooktop glass is broken, turn off power to the unit. Do not operate until the glass has been replaced by a Wolf Factory Authorized Service Center technician.
i. This product must be repaired only by a Wolf Factory Authorized Service Center technician. The cooktop must be disconnected from power prior to service.

END OF SECTION 11 31 00

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Qualities:
- Facilitate separation of waste (conserves resources).

Recommendations:
- Provide systems that are easy to operate.
- Specify containers made from recycled materials (conserves resources).
- Specify durable materials (conserves resources).

1.2 SUBMITTALS
Provide written instructions for building managers and tenants of multi-unit buildings.
Provide signage and labeling at recycling areas.

PART 2 - PRODUCTS
2.1 INDOOR RECYCLING BINS
Under-Counter Recycling Bins: Roll-out and/or revolving bins for separation of recyclable materials; construction: post-consumer plastic
High-Rise Recycling System: Turntable-mounted bins to receive recyclables from trash chutes; controlled by electronic keypads

2.2 OUTDOOR RECYCLING RECEPTACLES
Curbside Bins: Recycled-content plastic
Roll-out Cans/Carts:
Provide appropriate signage.
Size: 32 gallons to 2 cubic yards

END OF SECTION 11 82 23

Division 12: Furnishings

Section 12 00 00 - Furnishings
Section 12 20 00 – Window Treatments
Section 12 58 26 – Entertainment Centers
Section 12 93 00 – Site Furnishings

SECTION 12 00 00 - FURNISHINGS 12 00 00-1

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Problems:
Fabrics typically are treated with chemicals to resist microbial attack (adversely affects indoor air quality).
Cotton is typically grown with heavy use of pesticides and chemical fertilizers.
Synthetic fibers are petroleum-based. (Petroleum is a limited resource, and its extraction and processing cause environmental damage.)
Manufacture of fabrics typically involves heavy metals and other toxins (adversely affects indoor air quality, causes environmental damage).
Wood: Conventional forest management (may damage natural habitats and biodiversity; cause erosion and silting of rivers; depletion of resources; tree plantations are more susceptible to disease).
Solvent-based paints and coatings (contributes to air quality problems).
Recommendations:
Select organically grown plant fibers.
Select fibers that are naturally pest-resistant.
Select natural dyes or undyed fabrics.
Select recycled synthetic fibers.
Select certified or reclaimed wood.
Specify refurbished furniture.
Select powder-coated or mill finish (unpainted).

1.2 SUBMITTALS
[INCLUDE IF PURSUING SALVAGED MATERIALS CREDIT(S) FOR LEED™] Submit invoices and documentation showing origin of any salvaged products, and include an estimated cost for a new product serving the same function.
[INCLUDE IF PROJECT REQUIRES RECYCLED CONTENT DOCUMENTATION, SUCH AS FOR LEED™ RECYCLED CONTENT CREDIT(S)] Submit invoices and documentation from manufacturer of the amounts of post-consumer and post-industrial recycled content by weight for products with specified recycled content.
[INCLUDE IF PURSUING LOCAL MATERIALS CREDIT(S) FOR LEED™] Submit invoices and documentation showing manufacturing locations and origins of materials for products [manufactured] [manufactured and sourced] [SELECT ONE, BASED ON CREDIT BEING PURSUED] within 500 miles of the building site.
[INCLUDE IF PURSUING RAPIDLY RENEWABLE MATERIALS CREDIT FOR LEED™] Submit invoices and listing of rapidly renewable materials. If a product contains a mix of materials, provide documentation from manufacturer showing amount of rapidly renewable content by weight.
[REQUIRED FOR LEED™ CERTIFIED WOOD CREDIT] Certificates: Submit certification from an independent certification organization accredited by the Forest Stewardship Council certifying that wood comes from an independently certified, well-managed forestry source.
Chain of Custody: Submit Forest Stewardship Council certification numbers and copies of invoices bearing these numbers as documentation that lumber was properly segregated from other materials while in storage and production.
[REQUIRED FOR LEED™ IEQ CREDIT 4.1, LOW-EMITTING ADHESIVE AND SEALANTS] Provide a cut sheet and/or material safety data sheet for every sealant used within the building (not including the exterior surface of the building), with VOC levels highlighted.
[REQUIRED FOR LEED™ IEQ CREDIT 4.4, LOW-EMITTING COMPOSITES] Provide a cut sheet or other documentation for every composite wood and ag-fiber product used, verifying that no urea-formaldehyde resins were used.

Submit manufacturer's product specifications for fabrics, including Material Safety Data Sheet (MSDS), and verification of organically grown fibers where specified.

PART 2 - PRODUCTS
2.1 MATERIALS
Fabric
Fibers:
Natural fiber fabrics: Organically grown cotton, wool, or ramie
Synthetic fiber fabrics: 100% recycled content
Dyes: Nontoxic [Free from mutagens, carcinogens, bioaccumulative or persistent toxins, heavy metals, and endocrine disrupters]
Wood casework:
FSC-certified
Salvaged
Avoid MDF, particleboard, or ag-fiberboards made with urea-formaldehyde resin.
Plastic Furniture:
Post-consumer recycled plastic

2.2 FURNITURE [Give preference to companies with strong environmental principles, including recycling programs, reduced VOC emissions, and use of FSC-certified wood.]
Refurbished, remanufactured furniture
Furniture made from recycled materials
Wood furniture: FSC-certified

PART 3 - EXECUTION
3.1 WASTE MANAGEMENT
Separate packaging materials in accordance with the Waste Management Plan and place in designated areas for recycling.

END OF SECTION 12 00 00

PART 1 – GENERAL

1.1 SUMMARY

A. Window treatments necessary for privacy shading and/or blocking solar heat gain.

1.2 - REFERENCES

A. NFPA 701 – Standard methods of fire tests for flame propagation of textiles and films

1.3 PRODUCT DATA

A. Product data
   a. For each type of product indicated. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions.

PART 2 – PRODUCTS

A. The following window treatments may be used:
   1. Solar shades
   2. Horizontal blinds
   3. Pleated shades
   4. Roller shades
   5. Cellular shades

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.
B. Field Measurements: Where shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.
   a. Allow clearances for operable glazed units' operation hardware throughout the entire operating range.

3.2 INSTALLATION

A. Install shades level and plumb, according to manufacturer's written instructions. Install intermediate support as required to prevent deflection in headrail. Allow clearances for window operation hardware.
B. Adjust shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range

3.3 CLEANING/PROTECTION

A. Clean shade surfaces after installation, according to manufacturer's written instructions
B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that shades are without damage or deterioration at time of Substantial Completion.
C. Replace damaged shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 12 20 00

PART 1 – GENERAL

A. This section includes information for the MacBook laptop computer to be used

PART 2 – PRODUCTS

2.1 TELEVISION

A. Sharp LCD television

a. Model numbers: LC37SH20U, LC32SH20U, LC26SH20U, LC26DV20U, LC20DV20U, LC20SH6U, LC15SH6U, LC13SH6U

END OF SECTION 12 58 26

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Use on-site and local materials.
Select durable materials (conserves resources).
Select recycled-content materials (conserves resources, diverts materials from landfill).
Select certified wood products (conserves resources, protects habitats).
Use treated lumber products that do no contain arsenic or chromium (reduces pollution, protects habitats).
Specify stainless steel or hot-dip galvanized fasteners with ACQ or copper azole wood treatment.

1.2 SUBMITTALS
Product Data: Submit product data on wood preservative materials and include application instructions.

PART 2 - PRODUCTS
2.1 MATERIALS
Wood:
- Untreated, naturally rot-resistant, heart wood [cedar, elm, black locust]
- FSC-certified wood products (see Section 06100, 1.02)
- Salvaged lumber (see Section 06100, 1.02)
- Wood, Pressure-Treated. (Do not use CCA lumber) ACQ: Ammoniacal copper quarternary compound

Plastic Lumber: 100% recycled plastic lumber
Composite plastic lumber: Fiberglass-reinforced recycled HDPE plastic
Metal:
- Cast Iron: 100% post-consumer, recycled content
- Aluminum: Minimum 50% post-consumer recycled content

2.2 PRODUCTS
Tree Guards: 100% post-consumer plastic
Benches, Tables, Chairs, Waste Receptacles, Miscellaneous Site Furnishings:
- Wood: (see 2.01 A, above)
- Metals with high recycled content or from salvaged source
- 100% post-consumer plastic or composite plastic

Planters and Deck Railings/ Guards: Wood from salvaged, or FSC-certified, well-managed forest products

PART 3 - EXECUTION
3.1 WASTE MANAGEMENT
Separate and recycle waste materials in accordance with the Waste Management Plan and to the maximum extent economically feasible.

END OF SECTION 12 93 00

Division 22: Plumbing

Section 22 00 00 – Plumbing
Section 22 12 00 – Facility Water Storage Tanks
Section 22 42 10 – Plumbing fixtures
Section 22 11 00 Facility water distribution

22 00 00 PLUMBING 22 00 00-1

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS

A. Qualities:
    1. Potable water plumbing supplies fresh water to users.
    2. Waste water plumbing allows for hygienic removal of waste.
B. Problems:
    1. Potable quality water is used for irrigation and conveying waste (fresh water is a limited resource).
    2. Leaks account for up to 20% of water use in urban areas.
C. Recommendations:
    1. Select low-flow, water-efficient plumbing fixtures.
    2. Avoid polyvinyl chloride (PVC) pipe for water delivery and drain systems (due to potential impacts of PVC disposal at end of product life).
    3. Do not use solder containing lead.
    4. Select durable materials.
    5. Use graywater (nontreated water from showers, bathroom sinks, clothes washers) for below-grade landscape irrigation.
    6. Use treated wastewater (separately supplied by some municipal water utilities) for nonpotable uses (toilet flushing, above-ground irrigation).

1.2 DEFINITIONS

A. Energy Factor: Measure of water-heater efficiency (higher factors represent higher efficiencies)

PART 2 - PRODUCTS
2.1 MATERIALS

A. Fixtures:
    1. Sink
        a. Secondary kitchen sink that drains to graywater system
        b. Sink with disposal chute to compost bucket under sink
    2. Flush toilets: Maximum 1.6 gallons per flush
        a. Gravity-flush: [Select toilets with high consumer and plumber performance ratings to avoid double flushing.]
        b. Pressure-assisted
    3. Composting toilets: Features:
        a. Electric fans: [Accelerates decomposition]
        b. Mixing tines: [Accelerates decomposition]
        c. Electric heat: [Accelerates decomposition, energy-intensive]
    4. Urinals:
        a. Waterless: No-flush; trap seal: lighter-than-water, biodegradable oil and alcohol
    5. Fittings:
        a. Low-flow fixtures
        b. Air induction: Low-flow shower head with Venturi air induction; 1.5 to 2.5 gallons/minute [Effective with very low water pressure}
        c. Flow reduction in faucets: Laminar flow, reduces water flow by up to 30%
        d. Flow reduction in sinks or showers: [Limits water flow by restricting flow; not recommended due to poor user satisfaction]

6. Faucet controls:
    a. Hot/cold mixing valve: Connects to hot-water side
    b. Flow reduction faucets: Limits water flow by restricting flow
    c. Pedal controls: Foot-operated flow control [Savings in locations where water is unnecessarily left running continuously during use, such as kitchens and hospitals]
7. Water Heaters: [Gas-fired are more efficient that electric resistance heaters.]
    a. Tank-storage water heaters: Minimum Energy Factor = 0.80
    b. Electronic ignition
    c. Sealed combustion
    d. Avoid electric resistance water heaters.
    e. Demand gas water heaters: Tankless water heaters, Minimum Energy Factor: 0.80 [Minimize standby losses]
    f. Electronic ignition
    g. Sealed combustion
    h. Avoid electric resistance water heaters.
8. Hot-water demand system: [Electronically controlled valve and pumping system returns water in hot-water pipes back to hot-water tank and brings hot water to tap quickly (no wasted water as user waits for water to get hot).]
9. Heat Exchangers:
    a. Wastewater heat exchanger: [1/2" soft copper water-supply pipe wrapped around 3" or 4" copper drain pipe from hot water fixtures, shower, tub, sink, dishwasher, or washing machine]
    b. Waste-heat heat exchanger: [Captures waste heat from air conditioners and heat pumps for producing hot water more efficiently]
    c. Flue-gas heat exchanger: [Stainless steel flue heat exchanger transfers heat to water heater.]

2.2 RELATED MATERIALS

A. Pipe:
B. Waste pipe:
    a. Cast iron pipe: Waste and vent pipe of 100% recycled scrap iron
    b. Polyvinyl chloride (PVC): Minimum 25% post-industrial plastic
    c. ABS drain pipe
C. Supply pipe:
D. Copper: [Do not use solder containing lead.]
    a. Galvanized steel
    b. Polyethylene pipe
E. Polyvinyl chloride (PVC): [Avoid due to environmental impacts during manufacturing and from incineration]

PART 3 - EXECUTION

3.1 MAINTENANCE

A. Inspect fixtures and fittings regularly; replace washers and repair leaks promptly. [Leaks can account for 25% of municipal water consumption].

3.2 WASTE MANAGEMENT

A. Separate waste in accordance with the Waste Management Plan and place in designated areas in the following categories for reuse:
    a. Copper pipe
    b. Ferrous pipe
    c. Close and seal tightly all partly used adhesives and solvents; store protected in well-ventilated, fire-safe area at moderate temperature.

USDT 3002 Temperature Differential Controller

At the factory, USDT 3002 is set to control a standard solar water heating system with an auxiliary relay to divert surplus heat. The auxiliary relay can be used to maintain the tank temperature, protect the system from overheating or provide another heat source to heat the storage tank. The controller has inputs for four PT1000-sensors. The fourth sensor may be used as for an additional temperature reading or for a flow meter. A 3-key-panel below a large LCD serves as the user interface. Simple icons give information about the function and operational mode of the controller and the system performance.

- **System status diagnostics**
- **Symbolic display of all para-meters**
- **Up to 4 temperature sensors Pt1000**
- **Manual override of pump for system testing**
- **Two Relay Outputs**
- **Adjustable factory settings of Delta T**
- **Flow meter capability**
- **Simple 3-Button operation**
- **Emergency collector shut-off temperature**
- **Solar operating hours counter**
- **Energy collection measurements**

Unit Externals
Housing: plastic, PC-ABS and PMMA
Protection type: IP 20 / DIN 40050
Environmental temp.: 0 ... 104 °F
Size: 172 x 110 x 46 mm
Mounting: wall mounting, mounting into patch-panels is possible
Power supply: 115 V~
Total power supply: 2 x 1 A
Mode of operation: Typ 1.b

Breaking capacity per relay: electromechanical relay: 2 x 1 A

Package includes:

1 x USDT 3002

1 x accessory bag1 x spare fuse T4A2 x screws and dowels4 x strain relief and screws

Additionally enclosed in the full kit:1 x sensor FKP62 x sensor FRP6

Technical Product Data - HT/Armaflex

Properties	Values	Remarks
Material	Foamed EPDM Rubber	
Max. Surface Temperature	+150° C	For temperatures between -50° C and -200° C, please consult our Technical Department.
Min. Surface Temperature	-50° C	
Thermal Conductivity at 0° C	0.038 W/(m · K)	Test according to BS 874 Part 2 1986
Thermal Conductivity at +40° C	0.042 W/(m · K)	
Water Vapour Permeability	Moisture Resistance Factor μ > 4,000	Test according to DIN 52 615
Water Absorption	0.2% by volume	Test according to ASTM C 209
Surface Spread of Flames	Class 1	Test according to BS 476 Part 7: 1997
Reaction to fire	Self-extinguishing, does not drip	
Noise Reduction	Sound Absorption Coefficient ISO 354:2003 - up to 0.8	Also suitable for use in the prevention of sound passage
Resistance to	Building Materials: Very Good Ozone: Very Good UV: Very Good Chemicals: Consult Product Test List	
Health Aspects	Dust & Fibre Free	
Other Properties	ODP zero GWP zero	
Outdoor Applications	NO additional coating or painting is necessary - **HT/Armaflex is UV-resistant.**	

Armacell UK Limited · Mars Street, Oldham, Lancs. OL9 6LY · Tel 0161 287 7100 · Fax 0161 633 2685 · www.armacell.com · info.uk@armacell.com
Copyright: Armacell UK Ltd., Oldham · Subject to change without notice.

Electric Actuator with 3-Way Brass Ball Valve

MATERIALS

Electric Materials

Housing: NEMA 4 rated, 4X Rated, Polyester Powder Coated Cast Aluminum

Gear Train: Hardened Steel

Output Shaft & Override: 416 Stainless Steel

Output Shaft Seals: Buna-N

Lubrication: Permanent

Motor: Reversing 115VAC, 12 or 24 VAC or VDC

Duty Cycle: 50% (DE) and 30% (MA)

Cycle Time: 2.5-15 seconds

Temperature Range: -40°F to 150°F depending upon application.

3-Way Brass Valve

Stem: Nickel Plated Brass

Ball: Chrome Plated Brass

Seats & Thrustwasher: PTFE

Stem Seal: Viton® O-Ring

Valve Rating: 400 psi CWP

Actuator sized for 400 psid CWP

Temperature Range: -15°F to 300°F*
*Dependent on Application.

FEATURES & BENEFITS

Compact

Reliable

Economical

Factory Sized & Assembled

One Year Warranty from Installation

Add-on accessories provide these units with wide application appeal

1/2" to 1 1/2" sizes can be wired in parallel

END OF SECTION 22 00 00

PART 1 - GENERAL

1.1RELATED SECTIONS

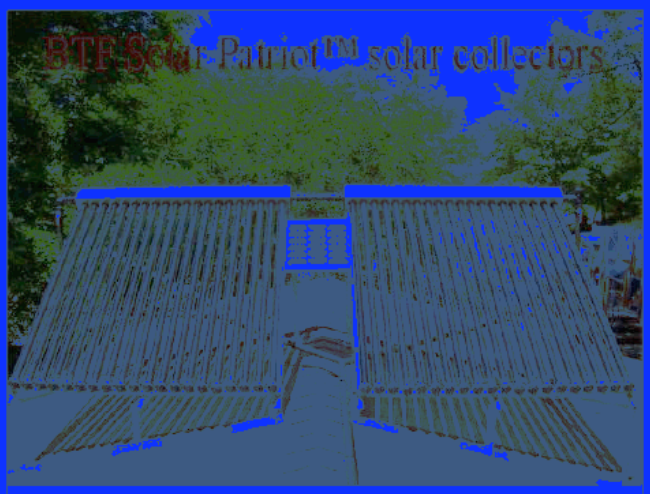
A. Section 23 56 00 – Solar Energy Heating Equipment

PART 2 – PRODUCTS

1.1 SP-20 Solar Evacuated tube collector

A. Manufacturer: BTF Solar, Part number: Solar Patriot -20,
B. Backwards to the Future Ltd. (BTF Ltd.) POB 409, Fennville Michigan 49408 USA
C. Thermomax 60 gal. DHW storage tank, Product number: SST60, 3181 Kingsley Street, Victoria, BC, Canada, V8P 4J5
D. H & H Tube copper Piping, 3/4" Rigid Copper Piping (4 feet), P.O. Box 455, 108 Garfield Street, Vanderbilt, MI 49795
E. Brass Tubular Products & Copper Tubular Products
    a. The redraw mill is the heart of the H & H Tube operation. For over 75 years, H & H Tube has been a leader in the non-ferrous brass and copper tube industry, and has achieved great success in its technology to redraw brass and copper tubular products.
    b. H & H Tube inventories a wide variety of alloys: CDA 122 copper, 120 copper, 230 red brass, 260 brass, 260 welded, 330 low leaded brass, 443 arsenical admiralty brass, 740 nickel silver, 752 nickel silver, 706 copper nickel and 715 copper nickel.
    c. Our redraw capabilities include diameters from .125" to 3.25" and wall thickness from .012" to .125", available in both brass tube and copper tube. Please consult our sales department for heavier wall thicknesses.

BTF Solar Patriot™ solar collectors



Port Crescent State Park in Port Austin, Michigan

Installed by J&J Services Energy Specialists 2005

photo of SP-20 coated evacuated tube collector

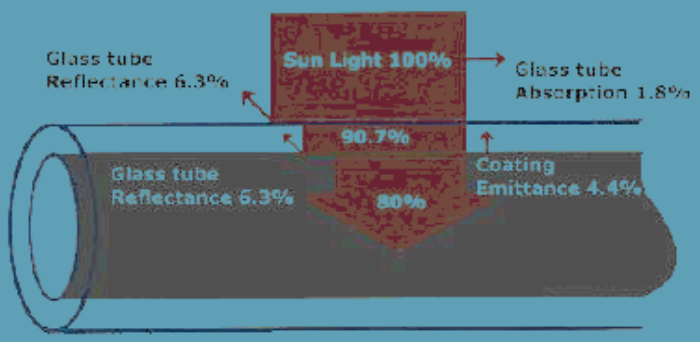
Evacuated Tube Heat Pipe Principles:

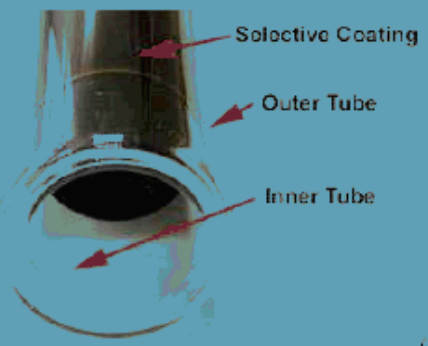
Patented Copper/Nickel Selective Surface Technology

The multiple deposition selective surface absorbs the full visible and infrared light radiation wave lengths from 0.3 to 1.3 *u*. First deposition is a **copper metal** layer, M-AL-N / CU which has low emission ratio and high thermal transmission through inner glass wall to the refrigerant heat pipe. Effective work range of 572 to 662 deg F
Second deposition is layer of **AL2 O3** film to prevent cross migration. This entrainment allows the copper molecular layer to be very stable at temperatures in excess of 750 deg F.
Third deposition is a cermet **aluminum nitride** AL-N/M-AL-N sputtered simultaneously in gas mixture of argon and nitrogen to produce which absorbs solar radiation at very low emissivity, a = 95% ; e = 5%.

Operating principles of double wall vacuum tube with selective surface coating	
The key component of the solar collector is the double wall vacuum tube. It is made by two concentric transparent borosilicate glass tubes (Pyrex) able	

to resist impact from hail up to 25mm in diameter. The inner glass tube is coated with a selective coating of Al-N Al, which absorbs and converts the maximum of solar radiation & infrared light into heat and reduces emissivity. A barium getter is used at bottom of the inner evacuated tube. This barium layer actively absorbs all CO, CO2, N2, O2, H2O The 'tube' is one continuous piece with no metal embedded which makes the vacuum tube have longer service life time.



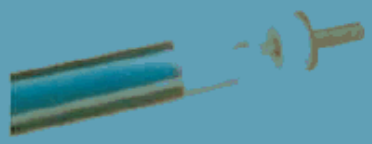


(c) 2003

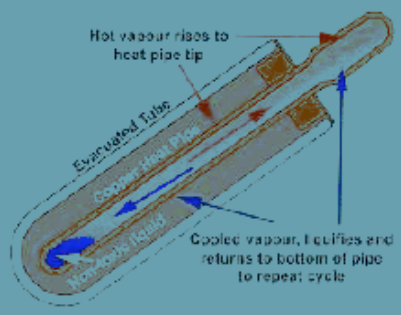
Vacuum tube with heat pipe inserted

The heat pipe evacuated tube system consists of the glass evacuated tube and a copper heat pipe which is installed within the glass tube. The copper heat pipe conducts from within the evacuated tube to its tip (condenser) which is plugged into the header pipe contained in the manifold. As water runs through the header pipe heat is transferred from the heat pipe condenser to the water. Collector conversion efficiency at 72% in full bright sunlight regardless of wind or freezing temperatures.

The drawing on the right illustrates the phase change operation of a refrigerant heat pipe.



(c) 2003



A heat-pipe is a sealed tube containing a small quantity of a volatile liquid with no air or other "permanent" gas present.

When it is placed vertically and the lower end is heated, liquid will evaporate and the vapour so formed will travel to the cooler parts of the pipe where it will condense and give up its latent heat to vaporisation. The condensate will then run back to the heated end where it can re-evaporate. This is illustrated above, right.

Because the heat transfer within the pipe comes from boiling liquid and condensing vapour, both of which processes have inherently very high heat transfer coefficients, and because the amount of material which has to move from one end of the pipe to the other is small, the effective thermal conductivity of the heat-pipe is very large.

To illustrate the magnitude of these quantities imagine that the heat-pipe is transmitting one kilowatt using refrigerant as the working fluid. The mass flow would be just under 0.5 g/s. At a temperature of 100 C in a 20 mm diameter pipe this would correspond to a vapour velocity of about 2.5 m/s.

In more sophisticated versions, the heat pipe contains a capillary wick to assist the return of the liquid from the condenser end to the evaporator end. Such pipes will work without the aid of gravity, for example in spacecraft. However, for terrestrial applications it is far cheaper and simpler two-phase thermosiphon, as the gravity return heat-pipe is usually known, is adequate.

The maximum operating temperature of a heat pipe is the critical temperature of the used heat transfer medium. Since no evaporation/condensation above the critical temperature is possible, the thermodynamic cycle interrupts when the temperature of the evaporator exceeds the critical temperature.

The main useful characteristics of the two-phase thermosiphon are:

(1) the thermal conductivity is extremely high, about a thousand or more times that of copper.

(2) the thermal conductivity is almost independent of the metal that the heat-pipe is made from.

(3) the device acts as a thermal diode. That is, the conduction is very high in one direction (upwards) and very low in the other (downwards).

These characteristics make heat-pipes useful wherever a large amount of heat needs to be conducted through a small cross-section. They have been used in cooling space-craft components, in cooling

plastics-forming dies, for the construction of air-to-air heat exchangers for industrial and domestic energy recovery, and in cooling electronic components mounted in confined spaces. Or, as the first heat exchanger in a solar thermal collector for domestic applications.

Photo of typical manifold with header heat exchanger pipe.

The manifold box is made of 20 ga. stainless steel and insulated with high density rock wool to R-17. The heat pipe condensers insert into the blind sockets in the header pipe. This causes a turbulence in the water flowing around each heat pipe socket, thus maximising the heat transfer conduction through the copper material and minimizing the pump run time.

Technical Data

Typical performance for 20 tube array with 7 hours of sunlight [2] produces more than 20,000 Btu's which will raise 50 gallons of water by 60 deg F. Paybacks of system costs as soon as 5 years of usage.

1 kW solar vacuum tube collector for 95 cents per rated watt, balance of system components described on this web site.

vacuum tube:

Length	*Outside dia.*	*Inside dia.*	*wall thickness*	*weight*	*material*
1800mm (70.8")	58mm (2.28")	47mm (1.85")	1.6mm (0.063")	2 kg (4.4lbs)	borosilicate glass 3.3

Selective surface	*Absorbtance (a)*	*Emissivity (e)*	*vacuum*	*thermal expansion*	*heat loss*
Cu / SS / AL N triple deposition	+95%@AM 1.5	5%@80degC	$P=5x10^{-3}PA$	$3.3x10^{-6}$degC	0.8W/m2 degC

hail resistance	*Warranty*

25 mm	5 years

heat pipe:

dimensions	*efficiency*	*heat transfer fluid*
8 x 1750 mm	+ 95%	non-toxic inorganic **refrigerant**

20 vacuum tube collector:

length	*width*	*height*	*gross area*	*net aperature*
1980 mm (77.9")	1.65 M (65.25")	170 mm (6.6")	*3.07 M^2 (33.1 sq ft)*	*2.01 M^2(21.64 sq ft)*

fluid capacity	*flow rate*	*pressure rating*	*aperature efficiency*	*power: watts (Btu/hr)*
1,300 ml	1 - 1.5 gal / min	65 psi max working	*+ 70%*	***1,024 W** (3,493 Btu/h) * at STC = 1,000 W/m^2insolation,**Ti -Ta** = 10 degC*

Collector assembly manual in PDF format: Assembly manual for SP-20 manifold collector.

Annual performance chart in Btu hours and 2006 payback guide in PDF: annual performace chart btu hours offset.

Michigan insolation values in PDf: insolation data for sites in state of Michigan.

The Solar Patriot (tm) collector has been tested by an independent laboratory. Here is the complete Canadian National Solar Lab report (requires Adobe Acrobat free reader program installed on your computer) :

Canadian National Solar Laboratory test report

The SP-20 collector has been certified in the USA by the Solar Ratings Certification Corporation (SRCC). BTF Ltd is a participating member of the Florida Solar Energy Center's SRCC.

SOLAR SUPER TANK

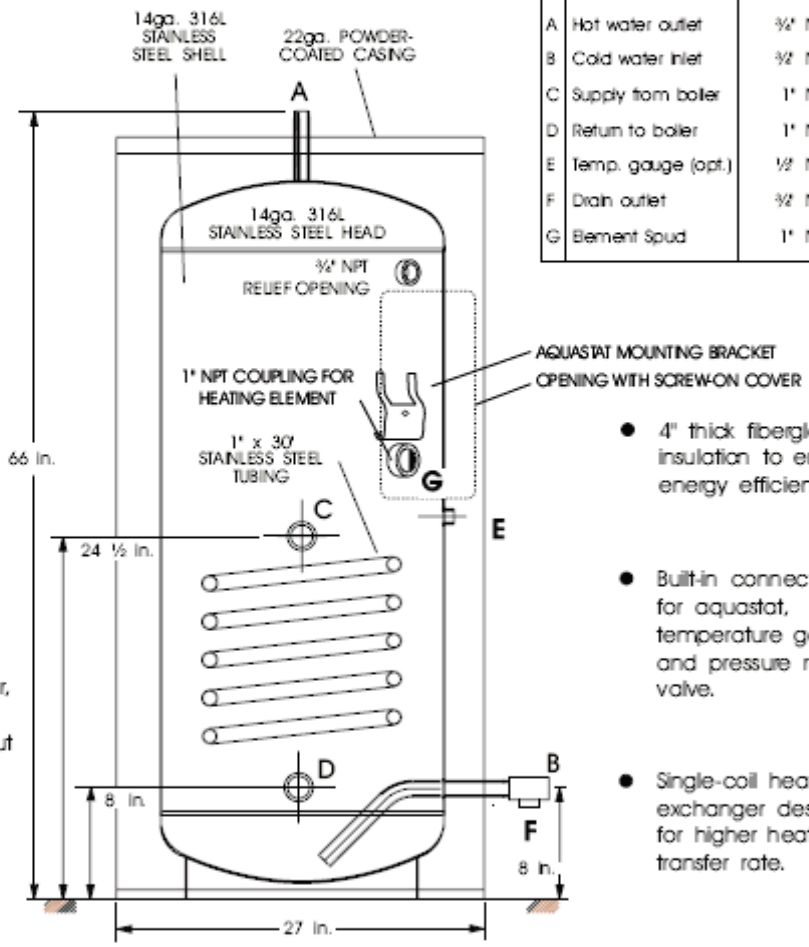
SST 60

INDIRECTLY FRED HOT WATER TANK

TANK CAPACITY U.S.gal.	HEAT EXCHANGER HEATING SURFACE sq.ft.	INSULATION THICKNESS inches	OPERATING PRESSURE psi.	MAX. OPER. TEMPERATURE F	SHIPPING WEIGHT lbs.	PRESSURE DROP - COIL ft.water.	COIL LENGTH feet/coil
60	7.85	4.00	150	175	200	3 @ 10 gpm	30

- Made in B.C.
- Uniquely-designed drain and cold water inlet to prevent build up of sediment.
- Designed for quick and simple installation in the field.
- Powder-coated casing for high quality finish and durability.
- To minimize coil wear, internal portions are continuous without any welds.
- 100% 316L Stainless steel tank and heat exchanger.

CONNECTIONS		
A	Hot water outlet	¾" NPT nipple
B	Cold water inlet	¾" NPT coupl.
C	Supply from boiler	1" NPT nipple
D	Return to boiler	1" NPT nipple
E	Temp. gauge (opt.)	½" NPT coupl.
F	Drain outlet	¾" NPT coupl.
G	Element Spud	1" NPT coupl.



- 4" thick fiberglass insulation to ensure energy efficiency.
- Built-in connection for aquastat, temperature gauge, and pressure relief valve.
- Single-coil heat exchanger design, for higher heat transfer rate.

Made Exclusively for Thermomax by
***K*-TAM Manufacturing Inc.**

10-YEAR MANUFACTURERS WARRANTY

THERMOMAX

See "Applications" on www.SolarThermal.com

3181 Kingsley St., Victoria, B.C. Canada V8P 4J5 Tel. (250) 721-4360 Fax. (250) 721-4329

1.3/10/00

END OF SECTION 22 11 00

PART 1 – GENERAL

1.1 - SUMMARY

A. This section contains information for the supply water tank and the waste water bladder tank

PART 2 – PRODUCTS

2.1 TANKS

A. American Tank, 305 Gal Fresh Water Poly Tank-LB 46Dx49H, Product No: 005-005

PART 3 – EXECUTION

3.1 HANDLING, USE, AND INSTALLATION

A. Our tanks are extremely durable, improper handling and installation can result in damage to tank, fittings, and accessories. Failure to comply with handling and installation instructions will void all warranties.
B. Upon delivery, inspect your tank immediately for defects or shipping damage. Any discrepancies, or product problems, should be noted on both the driver's bill of lading and your packing list.
C. When unloading your tank from the delivery truck, avoid its contact with sharp objects. Forklift blades can cause significant damage if proper precautions are not taken. Do not allow tanks to be rolled over on the fittings. Large bulk storage tanks, whenever possible, should be removed from truck bed by use of a crane or other suitable lifting device. Keep unloading area free of rocks, sharp objects, and other materials that could damage the tank. If tank is unloaded on it's side, carefully brace to prevent rolling.
D. Support the bottom of tank firmly and completely. Concrete pads provide the best foundation. However, when seismic and wind factors are not being considered, tanks with a base load bearing of less than 800 pounds per square foot require a firm, even, compacted bed of sand, pea gravel, or fine soil that won't wash away. Tanks with a base load bearing of 800 pounds per square foot, or greater, require a reinforced concrete base. Steel support stands concentrate the loaded tank weight onto the stand leg pads. It is recommended that stands be mounted on a concrete base. Bolting of stands is necessary to prevent movement due to agitation, wind, seismic loads and accidental contact.
E. WARNING:It is the installers responsibility to follow all appropriate NFPA, OSHA and government safety regulations. The following information has been provided as guidelines for tank use and installation. It does not address safety issues which may be present at specific tank installation sites. Use appropriate safety practices when handling any tank and/or using heavy equipment.
F. Test by filling tank with water prior to use, to prevent material loss through unsecured fittings, shipping damage, or manufacturing defects. Tanks should be tested for a minimum 5 hours.
G. Plastic bulkhead fittings are designed to be hand tightened. Over tightening can cause fittings to leak.
H. Support sides of rectangular tanks. In general, tanks with heights greater than 18" must be supported. However, specific applications must be considered: smaller tanks with contents that have high specific gravity and/or elevated temperatures must be supported.
I. Do not mount heavy equipment on top of the tank.
J. Do not allow any weight on tank fittings. Fully support pipes and valves.
K. DO NOT rigidly pipe tanks,use expansion joints to prevent damage at fittings from the differential expansion and contraction of the piping and tanks.
L. Tanks are designed for use only in the atmospheric storage of chemicals, never for vacuum or pressure applications.
M. Immersion heaters should never touch the walls of the tank. Minimum spacing should be 3" - 4" from wall.
N. Refer to the chemical capability chart on this site as a guide. Be certain tank, fittings, and gasket material are compatible with chemicals at ambient operating temperatures. Contact our support staff for information on chemicals not listed, or when uncertain conditions exist.
O. Protect tanks from impact, especially at temperatures below 40 degrees F.
P. Confined spaces must be considered hazardous. Do not enter tank without first taking proper precautions.

Tank sizes as listed are nominal and calibrations on molded tanks are only approximates, but provide an indication of volume. Polyethylene tanks expand and contract which will affect volume. The degree in which this occurs depends on the size of the tanks, wall thickness, specific gravity of contents, temperature of contents and ambient temperatures

END OF SECTION 22 12 00

PART 1 – GENERAL

1.1 SUMMARY

A. Rough and finish plumbing
B. Supply and installation plumbing fixtures and fittings
C. Pipe insulation

1.2 TESTS AND REPORTS REQUIRED

A. Test water service piping under hydrostatic pressure of 150 psi for not less than 2 hours. Perform this test prior to closing walls.
B. Perform all tests required by local building officials at rough in and finishing of work
C. Chlorinate water and well system at close out of job. Coordinate testing of water with local health officials.

PART 2 – PRODUCTS

2.1 VALVES

A. Valves, if not otherwise specified herein or on the Drawings, are to be of the appropriate size and type for the size and use of the pipe

2.2 TOILET

A. Toto Aquia™ Dual Flush Toilet, 1.6 GPF / 0.9 GPF, Model No: CST414M
    1. Elongated, 12" rough-in, less seat

2.3 SINK

A. Toto Lloyd™ Undercounter Lavatory, Model No: LT931
    1. Dimensions: 23” x 16”

2.4 SHOWERHEAD

A. Delta Showerhead, custom design

END OF SECTION 22 42 10

Division 23: Heating, Ventilation, and Air-conditioning (HVAC)

Section 23 00 00 – Heating, Ventilating, and Air-conditioning (HVAC)
Section 23 56 00 – Solar Energy Heating Equipment
Section 23 83 00 – Radiant Heating Units

SECTION 23 00 00 HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC) 23 00 00-1

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Qualities:
Mechanical heating and cooling temper the indoor environment.
Problems:
Inefficient heating and cooling equipment (consumes fossil fuels, a limited resource; contributes to global warming)
Condensation and air leakage can contribute to mold and health problems.
Air-conditioning equipment typically utilizes ozone-depleting chemicals.
Recommendations:
Select equipment with highest efficiency available.
Choose cooling equipment that does not utilize ozone-depleting refrigerants.
Maximize efficiency of mechanical systems through duct sealing and high-efficiency fans.
Select radiant heating systems that are effective at lower air temperatures.

1.2 DEFINITIONS
AFUE - Annual Fuel Utilization Efficiency: A measure of energy performance of heating plants
SEER - Seasonal Energy Efficiency Ratios: Compares cooling capacity in Btus to energy inputs in watts
EER - Energy Efficiency Ratio: The ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts (W) under designated operating conditions

PART 2 - PRODUCTS
2.1 Hydronic Heating Systems
Boilers: [Energy Star-rated; recommended AFUE: 85%]
High-efficiency combination water and residential space heating water heater; fuel: gas [Recommended AFUE: 94%]
Multi-fuel boiler: Wood (80% efficient) and gas or oil (85% efficient) [Automatic controls maintain wood fire and automatically turn on gas or oil when the fire dies down.]
Wood boiler: Central heating plant for multi-unit residential and larger building complexes; fuel: wood chips; feed: automated auger
Oil boiler: Oil-fired boiler, minimum AFUE: 85%
Modular boiler: Commercial heating [High-efficiency burners fire only when needed.]
Hydronic Distribution System:
Hot water radiators: [Operate at lower temperatures than convection radiators]
Radiant slab: [Operate at lower temperatures than radiators; efficient radiant heat source; slow response time]
Convection radiators: Copper tubing with aluminum convection fins [Operate at higher temperatures than radiators or slabs]

2.2 FORCED-AIR SYSTEMS
Furnace: [Energy Star-rated, recommended AFUE: 90%]
Sealed combustion, condensing furnace; fuel: gas [Recommended AFUE: 94%]
Air Distribution System:
Ductwork: Galvanized sheet metal: With fiberglass pipe wrap insulation
Insulated ducts: Fiberglass duct board, lined to prevent fiber shedding; minimum R-8 when used outside of insulated building envelope

Fiberglass duct board bonded with thermosetting resin, faced with fire-resistant foil, and coated with acrylic polymer treated with antimicrobial agent that does not support bacteria or mold growth
Textile ducting: Washable fabric ducts [Conditioned air passes through duct walls, filtering supply air, improving indoor air quality, and lowering room air velocity.]
Fans: High-efficiency, variable-speed motors
Whole house fans: Single port, Multiple ports
Photovoltaic-powered roof ventilator: 800 CFM
Bathroom and kitchen fans:
Power: 50 cfm - 13 watts; 70 cfm - 15 watts; 90 cfm - 17 watts; 100 cfm - 20 watts
Noise: 50 to 70 cfm - 0.5 sones; 90 cfm - 1.0 sones; 100cfm - 1.5 sones [Quiet operation will increase likelihood that fans will be used by occupants.]
Fan-light: Compact-fluorescent
Filters:
Pleated 1 in PLT: 25-mm [Eliminates 92% of micro particles]
Pleated 1 in MED: [Removes 99% of micro particles]
Bypass filters: Turbulent flow precipitator
HEPA filter: [99.9% efficiency rating at removing particles larger than 0.3 microns. Most mold spores are larger than 1 micron, and pollen is larger than 10 microns.]

PART 3 - EXECUTION
3.1 DESIGN
Do not oversize air-conditioning equipment. Follow recommendations of Air Conditioning Contractors of America, using the following manuals:
System sizing: Design Manual S
Duct sizing: Design Manual D [When in doubt, size upward.]
Grill location and characteristics: Design Manual T
Indoor and outdoor refrigeration coils shall be matched and from same manufacturer. Select a low sensible heat ratio for more moisture removal.
Design duct runs for maximum efficiency and minimum overall length.
Provide 1 sq. ft. of net-free vent area per 750 cfm of airflow for whole-house fans vented through the attic.

3.2 INSTALLATION
Follow recommendations of Air Conditioning Contractors of America, using Design Manual J.
Seal ducts with mastic and test for leaks. Confirm that duct leakage is less than 3% of coil airflow for new systems and less than 6% for existing systems.
Protect air distribution system from contamination during construction.
Clean air distribution system thoroughly before occupancy.
Seal all openings through walls, floor, and ceilings with expandable foam.
Isolate all vibrating equipment for piping and ductwork with flexible connections.
Balance system for efficient, even distribution of heating/cooling. Provide complete test and balance reports using the Associated Air Balance Council forms and methods.

3.3 WASTE MANAGEMENT
Separate waste in accordance with the Waste Management Plan and place in designated areas in the following categories for reuse:
Copper pipe, Ferrous pipe
Galvanized sheet metal
Close and seal tightly all partly used adhesives and solvents; store protected in well-ventilated, fire-safe area at moderate temperature.

END OF SECTION 23 00 0

PART 1 - GENERAL
1.1 ENVIRONMENTAL CONSIDERATIONS
Qualities:
Renewable resource (reduces need for petroleum-based, nuclear, and large hydroelectric energy sources)
Daylighting reduces need for electric lights (conserves energy).
Problems:
Supply varies with time of day (storage systems add cost; for solar electric, battery manufacture and disposal can involve hazardous materials).
Solar water heating systems require freeze protection in cold climates (adds cost and complexity to the system).
Recommendations:
Utilize direct utility interface (avoids battery storage).
Seek the greatest overall resource efficiency and energy efficiency in selecting solar energy systems.

PART 2 - PRODUCTS
2.1 FLAT PLATE SOLAR COLLECTOR
Hydronic:
Glazed: Copper tube attached to absorber plate
Absorber surface coating:
Titanium nitride oxide
Black chrome: [Avoid due to pollution associated with chromium]
Integral collector-storage: Collector includes large-diameter piping or tank(s) for water storage. [Simple, passive system; lower efficiency than pumped system]
Unglazed: Polypropylene [Lower efficiency than glazed collectors; primarily used for low-temperature applications, such as pool heating]
Air: Perforated sheet metal cladding to preheat ventilation air

2.2 CONCENTRATING COLLECTOR
Parabolic Mirror Concentrating Collector: [High-temperature industrial applications]

2.3 VACUUM TUBE COLLECTOR
Evacuated-Tube Collector [High-temperature residential and commercial applications.]

2.4 CONTROLLERS
Drain-Back System
Recirculating System
Simple Drain-Down Controls with proven freeze protection

2.5 STORAGE TANK
[Specify best feasible thermal performance; avoid insulation made with ozone-depleting blowing agents.]

2.6 PHOTOVOLTAIC CELLS
Single Crystal: Silicon wafers sawn from single silicon crystals, 15% to 24% efficient
Polycrystal: Silicon wafers sawn from polycrystalline silicon, 14% to 18% efficient
Thin Silicon Crystal (no wafer cutting required):
Ribbon technology: 11% to 13% efficient
Crystalline silicon on stainless steel substrate: 10% efficient
Thin-Film Amorphous Silicon (no wafer cutting required): 4% to 7% efficient [Lower efficiency, lower cost]
Tandem-junction
Triple-junction
Thin-Film Cadmium-Telluride (no wafer cutting required)
Thin-Film Copper Indium Diselenide CIS

2.7 BUILDING-INTEGRATED PHOTOVOLTAIC (BIPV) COMPONENTS
PV Glazing Modules:
Semi-transparent PV collectors for diffuse glazing applications
Opaque for spandrel glazing applications, overhangs, light shelves
PV Metal Roofing:
Standing-seam metal roofing manufactured with amorphous-silicon PV
Amorphous-silicon PV modules designed for retrofitting onto conventional standing-seam metal roofing
PV Shingles:
Amorphous-silicon tab shingles
Thick-crystal PV cells laminated onto fiber-cement shingles

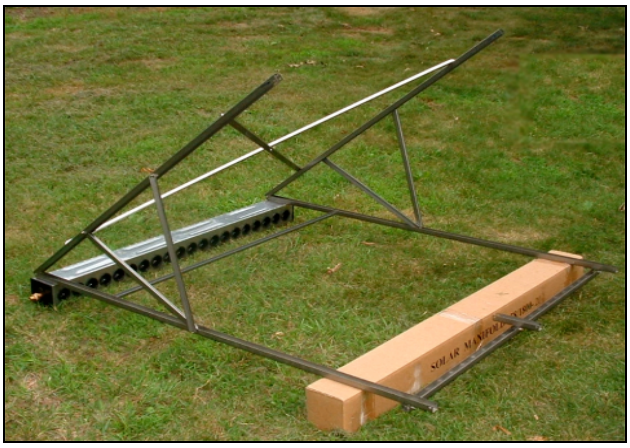
SP-20 Tubes Manifold System Assembly Guide

Copyright By BTF Ltd.

Note: Read all instructions & examine photos before starting

Assemble either roof mount frame or 60º ground frame UPSIDE DOWN Install left + right struts with nuts on manifold to longest & widest dimensions of slots.

For 60º frame install back struts and side braces, tighten nuts with one drop of locktite.



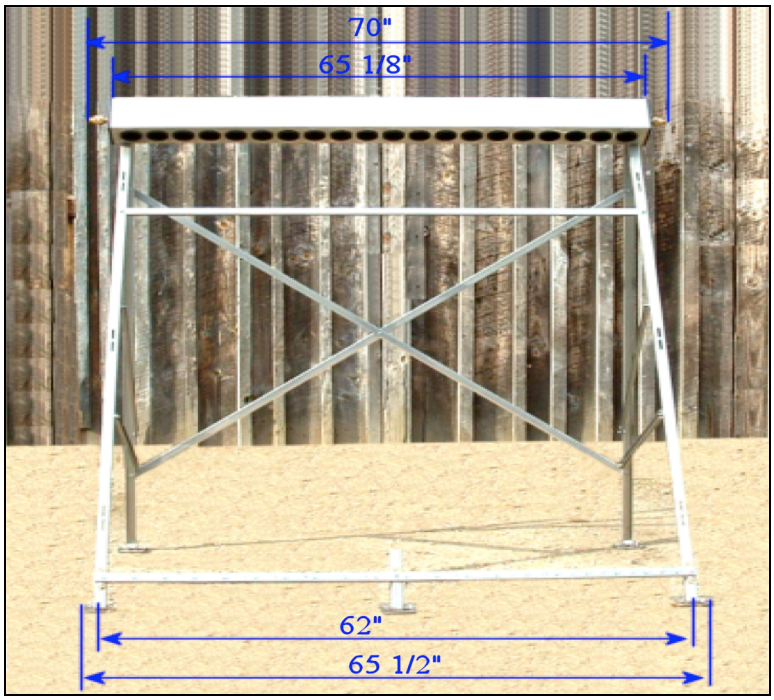
Install X brace. When done lift up frame. Check for square and locktite all fasteners.

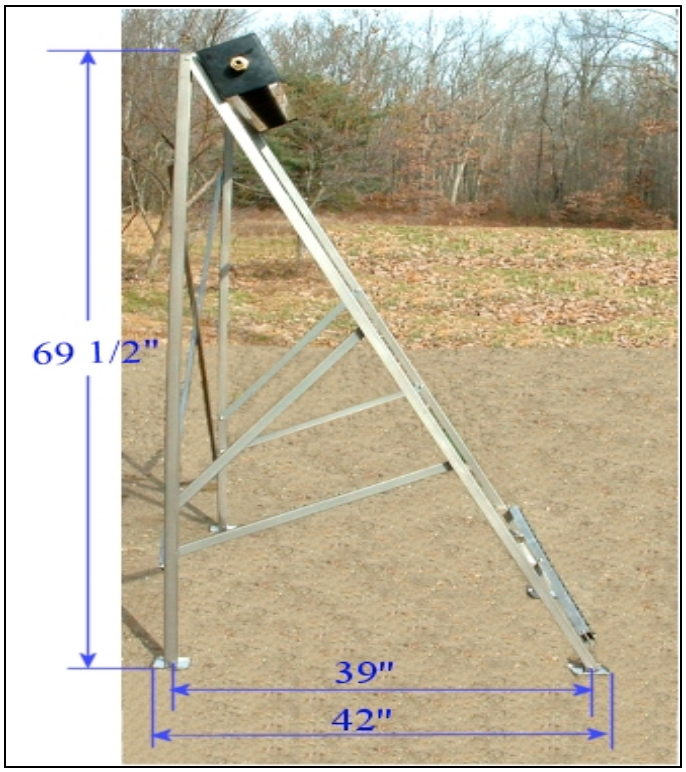
60 deg frame ready to mount

Do Not overtighten nuts

SP-20 Tubes Manifold System Assembly Guide

Copyright By BTF Ltd.





60° frame stand
(side view)

SP-20 Tubes Manifold System Assembly Guide

Copyright By BTF Ltd.

60° **Collector frame**

Keep the tubes covered in box before installing or the condenser will expand. They are quick to heat up.

Hold tubes vertical when handling. Coat condenser with thermal grease before inserting into manifold. Spread hands apart and gently. Have helper hold bottom boot on lower rail.

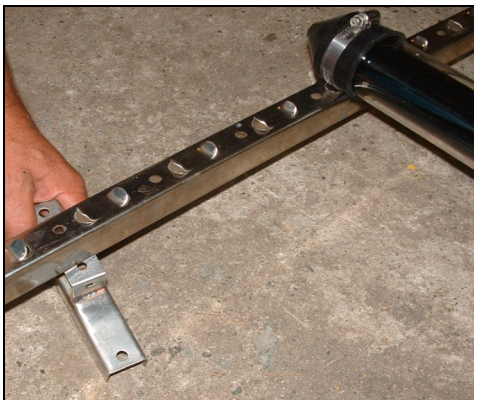
Smear just enough Vaseline into the upper rubber boot for smooth glass tube insertion.

SP-20 Tubes Manifold System Assembly Guide

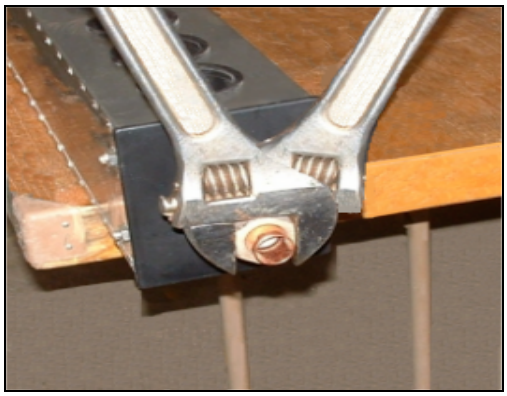
Copyright By BTF Ltd.

Place towel on lower strut when assembling

Tighten screw clamp to snug – DO NOT over torque. Use only 3 fingers on nut drivers to tighten band clamp to 12 to 15 inch pounds.



Must use center support

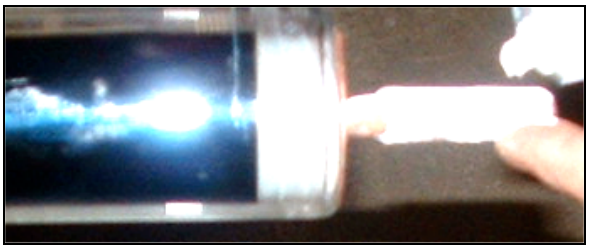


Always use two wrenches on manifold unions

* Must paste union seat & treads with Teflon thread sealant!

SP-20 Tubes Manifold System Assembly Guide

Copyright By BTF Ltd.



Coat condenser & socket with thermal grease provided in frame box

Use round screwdriver to paste thermal grease into manifold sockets

Put a few drops of machine oil on the worm screw of the band clamps

END OF SECTION 23 56 00

PART 2 - PRODUCTS
PEX Piping = RadiantPEX-AL, 3/4" x 300' (WATTS RADIANT)
RadiantPEX-AL, 3/4” x 300’ 81007608 RL12-300-OR 1 48 lb 840213082697 $510.00
PEX Fittings = 3/4" PEX closed syst. mech. pkg. (WATTS RADIANT)
PEX Manifold = 1/2" PEX slab manifolds (WIRSBO)
Hydronex Panels = P Panel, Manual Fill, Watts Radiant 15-58 Pump (WATTS)
Hydronex Panels = Dmix Valve Panel, 1 Watts Radiant 15-58 Pump (WATTS)
Warmboard
Vanhuard

Product Information

DOWFROST HD

Inhibited Propylene Glycol-based Heat Transfer Fluid

DOWFROST* HD heat transfer fluid is a formulation of 94.0 percent propylene glycol and a specially designed package of industrial corrosion inhibitors. The fluid is dyed bright yellow to aid in leak detection. Solutions in water provide freeze protection to below -50°C (-60°F) and burst protection to below -73°C (-100°F).

Recommended use temperature range: -45°C (-50°F) to 160°C (325°F)

Suitable applications: single fluid process heating and cooling, closed-loop, water-based HVAC applications where propylene glycol solutions are preferred or required.

For health and safety information for this product, contact your Dow sales representative or call the number for your area on the second page of this sheet for a Material Safety Data Sheet (MSDS).

Typical Concentrations of DOWFROST HD Fluid Required to Provide Freeze and Burst Protection at Various Temperatures

Temperature °C (°F)	Percent DOWFROST HD Fluid Concentration Required: For Freeze Protection Volume %	For Burst Protection Volume %
-7 (20)	18	12
-12 (10)	29	20
-18 (0)	36	24
-23 (-10)	42	28
-29 (-20)	46	30
-34 (-30)	50	33
-40 (-40)	54	35
-46 (-50)	57	35
-51 (-60)	60	35

NOTE: These figures are examples only and may not be appropriate to your situation. Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 20% glycol. Contact Dow for information on specific cases or further assistance.
ATTENTION: These are typical numbers only and are not to be regarded as specifications. As use conditions are not within its control, Dow does not guarantee results from use of the information or products herein; and gives no warranty, express or implied.

Typical Freezing and Boiling Points of DOWFROST HD Fluid†

Wt. % Propylene Glycol	Vol. % Propylene Glycol	Wt. % DOWFROST HD	Vol. % DOWFROST HD	Freezing Point °C (°F)	Boiling Point °C @ 101 kPa (°F@ 760 mmHg)	Degree Brix††	Refractive Index 22°C (72°F)
0.0	0.0	0.0	0.0	0 (32.0)	100.0 (212)	0.0	1.3328
5.0	4.8	5.3	5.1	-1.6 (29.1)	100.0 (212)	4.8	1.3383
10.0	9.6	10.7	10.2	-3.3 (26.1)	100.0 (212)	8.4	1.3438
15.0	14.5	16.0	15.4	-5.1 (22.9)	100.0 (212)	12.9	1.3495
20.0	19.4	21.3	20.6	-7.1 (19.2)	100.6 (213)	15.4	1.3555
25.0	24.4	26.6	26.0	-9.6 (14.7)	101.1 (214)	19.0	1.3615
30.0	29.4	31.9	31.3	-12.7 (9.2)	102.2 (216)	22.0	1.3675
35.0	34.4	37.2	36.6	-16.4 (2.4)	102.8 (217)	26.1	1.3733
40.0	39.6	42.6	42.1	-21.1 (-6.0)	103.9 (219)	29.1	1.3790
45.0	44.7	47.9	47.6	-26.7 (-16.1)	104.4 (220)	31.8	1.3847
50.0	49.9	53.2	53.1	-33.5 (-28.3)	105.6 (222)	34.7	1.3903
55.0	55.0	58.5	58.5	-41.6 (-42.8)	106.1 (223)	38.0	1.3956
60.0	60.0	63.8	63.8	-51.1 (-59.9)	107.2 (225)	40.6	1.4008
65.0	65.0	69.1	69.1	b	108.3 (227)	42.1	1.4058
70.0	70.0	74.5	74.5	b	110.0 (230)	44.1	1.4104
75.0	75.0	79.8	79.8	b	113.9 (237)	46.1	1.4150
80.0	80.0	85.1	85.1	b	118.3 (245)	48.0	1.4193
85.0	85.0	90.4	90.4	b	125.0 (257)	50.0	1.4235
90.0	90.0	95.7	95.7	b	132.2 (270)	51.4	1.4275
95.0	95.0	a	a	b	154.4 (310)	52.8	1.4315

† Typical properties, not to be construed as specifications.

†† Degree Brix is a measure of the sugar concentration in a fluid and is important in fermentation and syrups applications. Although there is no sugar present in DOWFROST heat transfer fluids, the glycol affects the refractive index of the fluid in a similar fashion.

a Propylene glycol concentrations greater than 94% are not attainable with DOWFROST HD fluid.

b Freezing points are below -50°C (-60°F).

NOTE: Generally, for an extended margin of protection, you should select a temperature in this table that is at least 3°C (5°F) lower than the expected lowest ambient temperature. Inhibitor levels should be adjusted for solutions of less than 20% glycol. Contact Dow for information on specific cases or further assistance.

*Trademark of The Dow Chemical Company

DOWFROST HD
HEAT TRANSFER FLUID

Engineering Specifications for Closed-Loop HVAC Systems

MANUFACTURER
The Dow Chemical Company
Thermal Fluids Business
100 Larkin Center
Midland, Michigan 48674
Phone: 1-800-447-4369

GENERAL PRODUCT DESCRIPTION

DOWFROST* HD industrially inhibited propylene glycol-based heat transfer fluid is manufactured by The Dow Chemical Company. Aqueous solutions of DOWFROST HD fluid are designed to provide freeze/burst and corrosion protection, as well as efficient heat transfer, in water-based, closed-loop heating and air-conditioning systems.

DOWFROST HD fluid has an operating temperature range of -50°F to 325°F; with fluid freeze protection to below -60°F, and system burst protection to below -100°F. The fluid contains corrosion inhibitors that are specially formulated for HVAC systems to keep pipes free of corrosion without fouling. DOWFROST HD fluid can be specified for use in new HVAC systems, or as a replacement fluid for use in existing systems. The fluid is dyed bright yellow to facilitate system leak detection.

DOWFROST HD fluid is also suitable for ice storage systems — used either in the closed circulation loop from the chiller to the storage medium; or, in solution with water, in the medium itself.

Compared to DOWFROST fluid, DOWFROST HD fluid features a higher maximum operating temperature, higher reserve alkalinity and greater thermal stability for longer fluid life. Extra-strength corrosion inhibitors in DOWFROST HD fluid are formulated for high temperature use, resulting in reduced maintenance and longer inhibitor life in most applications.

DOWFROST fluid is recommended for use in applications where low acute oral toxicity is important or where incidental contact with drinking water is possible.

Since the toxicity of heat transfer fluids may be adversely altered in HVAC systems, used fluids should be handled with reasonable care, and not be taken internally.

HVAC SYSTEM FLUID SPECIFICATION
Closed-loop, water-based systems

1. FLUID MATERIAL

The propylene glycol to be used in such a system must meet the following requirements:

1.1 The fluid must be an industrially inhibited propylene glycol (phosphate-based).

1.2 The fluid must be dyed [bright yellow] to facilitate leak detection.

1.3 The fluid must be easily analyzed for glycol concentration and inhibitor level.

1.4 For systems containing more than 250 gallons of fluid, annual analysis must be provided free of charge by the fluid manufacturer.

1.5 The fluid must pass ASTM D1384 (less than 0.5 mils penetration per year for all system metals).

1.6 The reserve alkalinity of the fluid must be at least 15 to provide long-term resistance to acidic pH.

2. FLUID INSTALLATION

Follow these installation procedures:

2.1 Clean new or lightly corroded existing systems with a 1% to 2% solution of trisodium phosphate in water prior to the installation of industrially inhibited propylene glycol fluid.

2.2 Extensively corroded existing systems should be cleaned by an industrial cleaning company and all necessary replacements and repairs should be made.

2.3 **Use only good quality water in solution with the propylene glycol fluid. Use water with low levels (less than 25 ppm) of chloride and sulfate, and less than 50 ppm of hard water ions (Ca^{++}, Mg^{++}). Distilled or deionized water is recommended.** If good quality water is unavailable, purchase pre-diluted solutions of industrially inhibited propylene glycol fluid from the fluid manufacturer or, if available, from the distributor.

3. SYSTEM DESIGN CONSIDERATIONS

3.1 Avoid use of automatic water make-up systems to prevent undetected dilution of the propylene glycol and possible contamination of the water system.

*Trademark of The Dow Chemical Company

Vanguard

PLUMBING

TECHData

MATERIAL SPECIFICATION

Vanex® Cross-linked Polyethylene (PEX)

SCOPE: This material specification designates the requirements for Vanguard Vanex PEX hot and cold water distribution tubing. All Vanex tubing is copper tube size dimension (CTS), SDR9 wall thickness and meets the respective requirements of ASTM F 876 and F 877.

MATERIAL: All Vanex tubing is manufactured from a cross-linkable high density polyethylene produced by grafting organo-silanes onto a polyethylene base. A catalyst (accelerator) added to the cross-linkable polyethylene during extrusion initiates the cross-linking process. Cross-linking is completed with hot water or steam. Vanex tubing is available in white or pigmented red or blue for easy identification of hot and cold lines.

MARKING AND CERTIFICATION: All Vanex tubing is marked with the name Vanguard as the manufacturer, nominal size, design pressure and temperature ratings, relevant ASTM standards numbers, manufacturing date and production code, as well as both the NSF-pw and the NSF CL-R/CL-TD stamps indicating third-party certification by NSF International for meeting and exceeding performance and toxicological standards, as well as achieving the highest chlorine resistance rating in the PEX industry. NSF conducts random on-site inspections of Vanguard manufacturing facilities and independently tests Vanex tubing for compliance with physical and toxicological standards. Vanex PEX is also listed with IAPMO, Warnock Hersey, the ICBO Evaluation Service and HUD (Housing and Urban Development).

RECOMMENDED USES: Vanex tubing is intended and recommended for use in hot and cold potable water distribution systems and hydronic radiant heating systems. Design temperature and pressure ratings for Vanex PEX is 160 psi @ 73°F and 100 psi @ 180°F. Vanex tubing can also be used in "continuously-recirculating" plumbing systems at temperatures of up to 140° F while still maintaining excellent chlorine resistance. For information on the suitability for other hot and cold water applications not listed here, consult with your Vanguard Piping Systems representative.

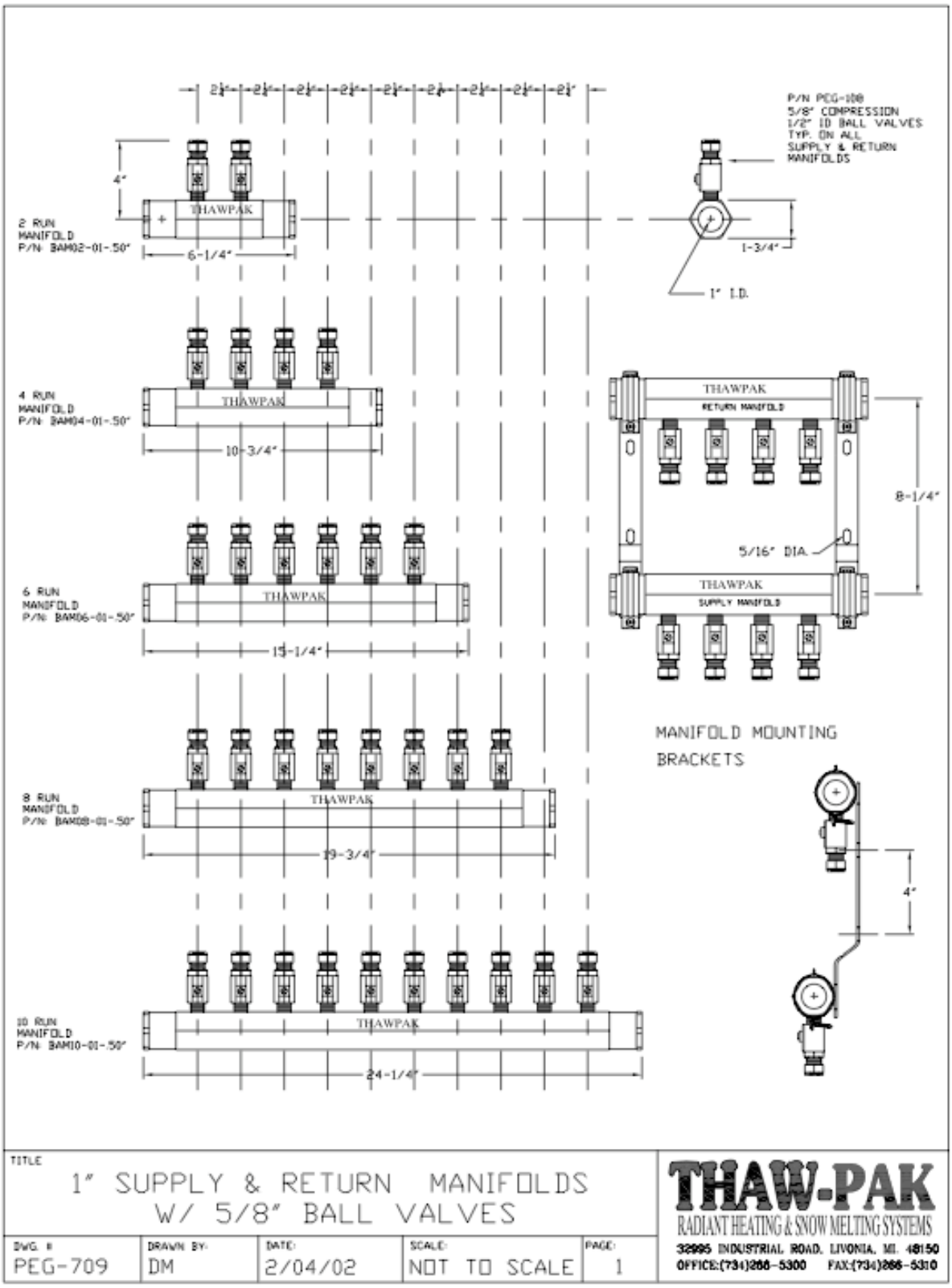
HANDLING AND INSTALLATION: Vanex cross-linked polyethylene tubing is tough yet flexible. However, it is softer than metals and may be damaged by abrasion or by objects with a cutting edge. Use of these materials in hot and cold water distribution systems must be in accordance with good plumbing practices, applicable code requirements, and current installation practices available from Vanguard. Vanex is manufactured to meet written national standards. Contact a Vanguard representative or the applicable code enforcement bureau for information about approvals for specific applications.

Property	ASTM Test Method	Typical Values English Units	Typical Values SI Units
Density	D 792	--	0.946 g/cc
Melt Index[1] (190° C/2.16 kg)	D 1238	--	0.7g/10min
Flexural Modulus[2]	D 790	120,000 psi	830 MPa
Tensile Strength @ Yield (2 in/min)	D 638	2,900 psi	20 MPa
Coefficient of Linear Thermal Expansion @ 68° F	D 696	8×10^{-5}/°F	15×10^{-5}/°C
Hydrostatic Design Basis @ 73°F (23°C)	D 2837	1250 PSI	8.6 MPa
@ 180°F (82°C)	D 2837	800 PSI	5.5 MPa
Vicat Softening Point	D 1525	255°F	124 °C
Thermal Conductivity	C 177	2.4 BTU/(hr)(ft²)(°F/in)	3.5×10^{-3} Watts/(cm²)(°C/cm)

1. Before Crosslinking 2. 73° F

www.vanguardpipe.com

QLTP27VS 4.04



TITLE

1" SUPPLY & RETURN MANIFOLDS
W/ 5/8" BALL VALVES

DWG. #	DRAWN BY:	DATE:	SCALE:	PAGE:
PEG-709	DM	2/04/02	NOT TO SCALE	1

THAW-PAK
RADIANT HEATING & SNOW MELTING SYSTEMS
32995 INDUSTRIAL ROAD, LIVONIA, MI. 48150
OFFICE:(734)266-5300 FAX:(734)266-5310

PowerStar
electric tankless water heaters

PowerStar
AE3.4; AE7.2; AE9.5; AE12

PowerStar point-of-use tankless water heaters are designed to provide an endless supply of hot water for kitchen, bathroom and hand-washing sinks. There are four under-sink models to choose from (dependent on desired temperature rise and flow rates). Common applications include: homes, offices, warehouses, service stations, stores and concession stands.

Endless hot water for one sink at a time.

FEATURES

c UL us
6K88 LISTED

- 99% efficient
- 5-year warranty on heat exchanger – 1 year on parts
- Saves space
- Installs vertically or horizontally (Model AE12 only installs horizontally)
- All models must be hardwired
- Solid copper heat exchanger, copper-sheathed elements and tough plastic housing
- High/low kW settings possible within most models
- No temperature/pressure relieve valve necessary (check local codes)
- Model AE12 has thermostatic adjustable control

THAW-PAK

Snow Melting & Radiant Heating

Basement-Pak

Installation Instructi

32995 Industrial Rd.
Livonia, MI 48150
Phone: 734-266-5300
Fax: 734-266-5310

Standard components supplied with system to Cover up to a 1000 square foot area:

Qty	Description	Part Number
(1)	Installation Kit	IK0013
(1)	Pressurization Test Kit	IP0006
(1)	Manifold Kit	BAM06-01-15"
(1)	Tie Wires (1000 CT.)	806018
(12)	Tube Bend Supports	UA9AE
(1)	Manifold Bracket Set	HRSMMB
(6)	½"x200' Pex Tubing	TPX3C2
(2)	Repair Couplers	BDUA10
(1)	Disposable Camera	CAMERA

1. Concrete installations require the contractor to properly grade area and set forms.

2. Locate and install all drainage fittings and sewer pipe. Locate any anchors for walls or partitions that will be installed after the concrete slab is poured.

3. The area must be thoroughly compacted with a mechanical compactor using compacted sand or pea gravel (1/2" or ¾" diameter @ 4" minimum depth).

4. Install insulation and vapor barriers as required. Check with appropriate code officials to determine what is required.

5. Cover the entire area with a 10 gauge wire mesh (6" x 6") as shown in the sample drawing provided. The wire mesh is used as a template for proper positioning of the THAW-PAK® tubing (Wire mesh provided by others).

6. Select a location to install the supply and return manifold. Provide a support or wall mount the manifolds using the brackets provided (HRSMMB).

7. Lay the THAW-PAK® tubing using a 12" center distance. Position tubing 6" from walls and other obstructions, using 6" minimum radius bends. Precaution should be taken to prevent kinks in Piping regardless of minimum radius.

8. Install the THAW-PAK® using the same lengths of tubing for each tubing circuit. See sample Drawings provided. Tubing is marked at every Two-foot increments. Each tubing run must range between 160'-200' lengths.

9. Make sure the THAW-PAK® tubing extends minimum of 8" past the manifold to allow enough room for connecting the tubing to the manifold. Label tubing runs with labels provided with the installation instructions.

10. Fasten the THAW-PAK® tubing with the tie wire fasteners provided at 2 to 3 foot intervals. Use fasteners and tool provided in the installation kit (IK0013) to secure the THAW-PAK® tubing to the wire mesh.

11. Observe caution in handling the THAW-PAK® tubing. Make sure it is not kinked or damaged, otherwise the rate of heat transfer will be reduced

12. Install one of the tubing turnout sleeves (UA9AE) on the supply and return end of the tubing run and position where the tubing enters and leaves the concrete slab. This protects the tubing from mechanical damage at the surface of the concrete slab.

13. Install one end of the circuit tubing into the supply manifold and the opposite end into the return manifold (BAM06-01-.50"). See instruction diagram for attatchment of tubing with the Swagelok fittings provided on the manifolds.

14. Repeat this step for each of the tubing runs.

15. Shoot several photographs of the tubing installation from a minimum of four (4) different angles and keep photographs for future reference and warranty documentation of the installation.

16. Each manifold is shipped with pressurization (IP0006) test kit equipped with a pressure gauge and an air valve. Fill and test the entire System with compressed air.

THE DOW CHEMICAL COMPANY

MATERIAL SAFETY DATA SHEET

Product Name: DOWFROST* HEAT TRANSFER FLUID **Effective Date**: 05/27/2004
MSDS#: 1376 **Page** 1 of 14

Dow (hereinafter, and for purposes of this MSDS only, refers to The Dow Chemical Company and to Dow Chemical Canada Inc.) encourages and expects you to read and understand the entire MSDS, as there is important information throughout the document. Dow expects you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

1.1 IDENTIFICATION

Product Name DOWFROST* HEAT TRANSFER FLUID

1.2 COMPANY IDENTIFICATION

The Dow Chemical Company
Midland, MI 48674

1.3 EMERGENCY TELEPHONE NUMBER

24-HOUR EMERGENCY TELEPHONE NUMBER: (989)636-4400.
Customer Information Number: 1-800-258-2436.

Distributed by **HUBBARD-HALL INC.**

MATERIAL SAFETY DATA SHEET

2. COMPOSITION INFORMATION

Component	CAS #	Amount (%W/W)
Propylene glycol	57-55-6	> 95 %
Demineralized water	7732-18-5	< 5%
Dipotassium hydrogen phosphate	7758-11-4	< 5%

3. HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Appearance Colorless

Physical State Liquid

Odor Mild

Hazards of product NO SIGNIFICANT IMMEDIATE HAZARDS FOR EMERGENCY RESPONSE ARE KNOWN.

3.2 POTENTIAL HEALTH EFFECTS

Effects of Single Acute Overexposure

Inhalation At room temperature, exposure to vapor is minimal due to low volatility. Mist may cause irritation of upper respiratory tract (nose and throat).

Eye Contact May cause slight temporary eye irritation. Corneal injury is unlikely.

Skin Contact Prolonged contact is essentially nonirritating to skin. Repeated contact may cause flaking and softening of skin.

Skin Absorption Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Swallowing Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

Chronic, Prolonged or Repeated Overexposure

Effects of Repeated Overexposure In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.
Other Effects of Overexposure No information currently available.

See Section 11 for toxicological information and additional information about potential health effects.

3.3 POTENTIAL ENVIRONMENTAL EFFECTS

See Section 12 for Ecological Information.

4. FIRST AID PROCEDURES

4.1 INHALATION

Move person to fresh air; if effects occur, consult a physician.

4.2 EYE CONTACT

Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

4.3 SKIN CONTACT

Wash skin with plenty of water.

4.4 SWALLOWING

No emergency medical treatment necessary.

4.5 NOTES TO PHYSICIAN

No specific antidote.
Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

MATERIAL SAFETY DATA SHEET

5. FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES - REFER TO SECTION 9, PHYSICAL AND CHEMICAL PROPERTIES

5.2 EXTINGUISHING MEDIA

Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Do not use direct water stream. May spread fire. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

5.3 FIRE FIGHTING PROCEDURES

Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.

5.4 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS

Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, pants, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

5.5 UNUSUAL FIRE AND EXPLOSION HAZARDS

Container may rupture from gas generation in a fire situation.
Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.
Liquid mist of this product can burn.
Flammable concentrations of vapor can accumulate at temperatures above flash point; see Section 9.

5.6 HAZARDOUS COMBUSTION PRODUCTS

During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

MATERIAL SAFETY DATA SHEET

6. ACCIDENTAL RELEASE MEASURES

Steps to be Taken if Material is Released or Spilled:
Small spills: Absorb with materials such as: Cat litter. Sawdust. Vermiculite. Zorb-all®. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Recover spilled material if possible. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. HANDLING AND STORAGE

7.1 HANDLING

General Handling
See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Ventilation
Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.

Other Precautions
Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion.

7.2 STORAGE

Store below: 121°C (250°F). Do not store in: galvanized steel.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

8.1 EXPOSURE LIMITS

Component	Exposure Limits	Skin. Form
Propylene glycol	10 mg/m3 TWA8 AIHA WEEL	

MATERIAL SAFETY DATA SHEET

In the Exposure Limits Chart above, if there is no specific qualifier (i.e., Aerosol) listed in the Form Column for a particular limit, the listed limit includes all airborne forms of the substance that can be inhaled.

A 'Yes' in the Skin Column indicates a potential significant contribution to overall exposure by the cutaneous (skin) route, including mucous membranes and the eyes, either by contact with vapors or by direct skin contact with the substance. A "Blank" in the Skin Column indicates that exposure by the cutaneous (skin) route is not a potential significant contributor to overall exposure.

8.2 PERSONAL PROTECTION

Respiratory Protection:	Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. In dusty or misty atmospheres, use an approved particulate respirator.
Ventilation:	Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines.
Eye Protection:	Use safety glasses.
Other Protective Equipment:	No precautions other than clean body-covering clothing should be needed. Use gloves chemically resistant to this material.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State: Liquid

Appearance: Colorless

Odor: Mild

Flash Point - Closed Cup: **102 °C** **216 °F** *Tag Closed Cup ASTM D 56* (Propylene glycol)

Flammable Limits In Air:

Lower	**2.6 %(V)**	*100 °C*	(Propylene glycol)
Upper	**12.5 %(V)**	*130 °C*	(Propylene glycol)

MATERIAL SAFETY DATA SHEET

Autoignition Temperature: **416 °C** **780 °F**

Vapor Pressure: **0.7 mmHg** *20 °C*

Boiling Point (760 mmHg): **162 °C** **323 °F**

Vapor Density (air = 1): **2.6**

Specific Gravity (H2O = 1): **1.05** *20 °C / 20 °C*

Freezing Point: **<= -51 °C** **<= -60 °F**

Melting Point: *Not applicable (for liquids)*

Solubility in Water (by weight): **100 %** *20 °C*

pH: **9 - 11** **(5% solution in water)**

Evaporation Rate (Butyl Acetate = 1): **0.07**

Percent Volatiles: **98 Wt%**

10. STABILITY AND REACTIVITY

10.1 STABILITY/INSTABILITY Thermally stable at recommended temperatures and pressures.

Conditions to Avoid: Product can oxidize at elevated temperatures. Generation of gas during decomposition can cause pressure in closed systems.

Incompatible Materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

Thermal Decomposition: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers.

10.2 HAZARDOUS POLYMERIZATION Will not occur.

MATERIAL SAFETY DATA SHEET

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Peroral

Rat; female; LD50 = 20300 mg/kg

Percutaneous

Based on information for a similar material:
Rabbit; LD50 = > 10000 mg/kg

DEVELOPMENTAL TOXICITY

Contains component(s) which did not cause birth defects or any other fetal effects in lab animals., The component(s) is/are:. Propylene glycol.

REPRODUCTIVE TOXICITY

Contains component(s) which did not interfere with reproduction in animal studies., Contains component(s) which did not interfere with fertility in animal studies., The component(s) is/are:. Propylene glycol.

CHRONIC TOXICITY AND CARCINOGENICITY

Similar formulations did not cause cancer in laboratory animals.

GENETIC TOXICOLOGY

In Vitro

In vitro genetic toxicity studies were negative.

In Vivo

Genetic toxicity studies in animals were negative for component(s) tested.

SIGNIFICANT DATA WITH POSSIBLE RELEVANCE TO HUMANS

In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

12. ECOLOGICAL INFORMATION

MATERIAL SAFETY DATA SHEET

12.1 ENVIRONMENTAL FATE

Based largely or completely on information for: Propylene glycol. Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Degradation is expected in the atmospheric environment within minutes to hours.

12.2 ECOTOXICITY

Based largely or completely on information for:, Propylene glycol., Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50 >100 mg/L in the most sensitive species tested).

12.3 FURTHER INFORMATION

Based largely or completely on information for: Propylene glycol. Bioconcentration potential is low (BCF < 100 or Log Pow < 3). Potential for mobility in soil is very high (Koc between 0 and 50).

13. DISPOSAL CONSIDERATIONS

13.1 DISPOSAL

DO NOT DUMP INTO ANY SEWERS, ON THE GROUND, OR INTO ANY BODY OF WATER. All disposal practices must be in compliance with all Federal, State/Provincial and local laws and regulations. Regulations may vary in different locations. Waste characterizations and compliance with applicable laws are the responsibility solely of the waste generator. DOW HAS NO CONTROL OVER THE MANAGEMENT PRACTICES OR MANUFACTURING PROCESSES OF PARTIES HANDLING OR USING THIS MATERIAL. THE INFORMATION PRESENTED HERE PERTAINS ONLY TO THE PRODUCT AS SHIPPED IN ITS INTENDED CONDITION AS DESCRIBED IN MSDS SECTION 2 (Composition/ Information on Ingredients). FOR UNUSED & UNCONTAMINATED PRODUCT, the preferred options include sending to a licensed, permitted: Recycler. Reclaimer. Incinerator or other thermal destruction device. As a service to its customers, Dow can provide names of information resources to help identify waste management companies and other facilities which recycle, reprocess or manage chemicals or plastics, and that manage used drums. Telephone Dow's Customer Information Group at 1-800-258-2436 or 1-989-832-1556 (U.S.), or 1-800-331-6451 (Canada) for further details .

MATERIAL SAFETY DATA SHEET

14. TRANSPORT INFORMATION

14.1 U.S. D.O.T.

NON-BULK
Proper Shipping Name : NOT REGULATED

BULK
Proper Shipping Name : NOT REGULATED

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

15.1 FEDERAL/NATIONAL

OSHA HAZARD COMMUNICATION STANDARD

This product is not a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 313

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTION 302

To the best of our knowledge this product does not contain chemicals at levels which

MATERIAL SAFETY DATA SHEET

require reporting under this statute.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 TITLE III (EMERGENCY PLANNING AND COMMUNITY RIGHT-TO-KNOW ACT OF 1986) SECTIONS 311 AND 312

Delayed (Chronic) Health Hazard : No
Fire Hazard : No
Immediate (Acute) Health Hazard : No
Reactive Hazard : No
Sudden Release of Pressure Hazard : No

TOXIC SUBSTANCES CONTROL ACT (TSCA)

All components of this product are on the TSCA Inventory or are exempt from TSCA Inventory requirements under 40 CFR 720.30.

CEPA - DOMESTIC SUBSTANCES LIST (DSL)

All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

EUROPEAN INVENTORY OF EXISTING COMMERCIAL CHEMICAL SUBSTANCES (EINECS)

The components of this product are on the EINECS inventory or are exempt from EINECS inventory requirements.

15.2 STATE/LOCAL

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA HAZARDOUS SUBSTANCES LIST AND/OR PENNSYLVANIA ENVIRONMENTAL HAZARDOUS SUBSTANCE LIST:

The following product components are cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List, and are present at levels which require reporting.

Component	CAS #	Amount

MATERIAL SAFETY DATA SHEET

Propylene glycol	57-55-6	96.0000 %

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

CALIFORNIA PROPOSITION 65 (SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

CALIFORNIA SCAQMD RULE 443.1 (SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT RULE 443.1, LABELING OF MATERIALS CONTAINING ORGANIC SOLVENTS)

VOC: Vapor pressure 0.66 mmHg @ 20° C
1002 g/l VOC
1030 g/l less water and less exempted solvents

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

16.1 ADDITIONAL INFORMATION

Additional information on this and other Dow products may be obtained by visiting our web page at www.dow.com.
Additional information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

MATERIAL SAFETY DATA SHEET

Propylene glycol	57-55-6	96.0000 %

PENNSYLVANIA (WORKER AND COMMUNITY RIGHT-TO-KNOW ACT): PENNSYLVANIA SPECIAL HAZARDOUS SUBSTANCES LIST:

To the best of our knowledge this product does not contain chemicals at levels which require reporting under this statute.

CALIFORNIA PROPOSITION 65 (SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986)

This product contains no listed substances known to the State of California to cause cancer, birth defects or other reproductive harm, at levels which would require a warning under the statute.

CALIFORNIA SCAQMD RULE 443.1 (SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT RULE 443.1, LABELING OF MATERIALS CONTAINING ORGANIC SOLVENTS)

VOC: Vapor pressure 0.66 mmHg @ 20° C
1002 g/l VOC
1030 g/l less water and less exempted solvents

This section provides selected regulatory information on this product including its components. This is not intended to include all regulations. It is the responsibility of the user to know and comply with all applicable rules, regulations and laws relating to the product being used.

16. OTHER INFORMATION

16.1 ADDITIONAL INFORMATION

Additional information on this and other Dow products may be obtained by visiting our web page at www.dow.com.
Additional information on this product may be obtained by calling Dow's Customer Information Group at 1-800-258-2436 (U.S.) or 1-800-331-6451 (Canada).

MATERIAL SAFETY DATA SHEET

contained in this MSDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given., Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that its activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of Dow, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product., Due to the proliferation of sources for information such as manufacturer-specific MSDSs, Dow is not and cannot be responsible for MSDSs obtained from any source other than Dow. If you have obtained a Dow MSDS from a non-Dow source or if you are not sure that a Dow MSDS is current, please contact Dow for the most current version.

HT ARMAFLEX

SAFETY DATA SHEET PAGE 1 OF 3

1. Identification of Product and Supplier

Product name: HT Armaflex.

Description: Flexible thermal insulation material.

Supplier: Armacell UK Limited, Mars Street, Oldham, Lancs. OL9 6LY.

Telephone: 0161 287 7100 Facsimile: 0161 633 2685.

2. Composition/information on ingredients

Based on synthetic rubber with additives for fire performance, flexibility and UV stabilisation.

3. Hazards Identification

None.

4. First Aid Measure

Ingestion: If swallowed, DO NOT induce vomiting. In small quantities there should be no adverse effects. If large quantities have been swallowed observe patients condition for up to 48 hours. Seek medical attention in the unlikely event that the patient is not well.

Inhalation: Under normal circumstances any dust created when the material is cut would not be airborne.

Eye contact: See above. If any dust particles lodge in the eye seek medical attention for their removal.

Skin contact: Not harmful.

armacell

Armacell UK Limited Mars Street, Oldham, Lancs. OL9 6LY
Tel: 0161 287 7100 Fax: 0161 633 2685

HT ARMAFLEX

SAFETY DATA SHEET PAGE 2 OF 3

5. Fire Hazards and Fire Fighting Measures

Hazards:	Material is stable under normal conditions. In the event of a prolonged fire, as with all organic materials, there will be carbon dioxide/carbon monoxide and water evolved together with small quantities of other gases, dependent upon the heat of the fire.
Extinguishing media:	Water spray or dry powder.

6. Spillage and accidental release measures

Initial action:	Non hazardous.
Clean-up procedure:	Solid non hazardous material.
Disposal:	Product may be disposed of as normal industrial waste.

7. Handling and Storage

Handling conditions:	No special precautions required.
Storage conditions:	Keep dry and not exposed to direct sunlight.

8. Exposure controls/personal protective equipment

Eye shield may be required if material is being cut in areas of high air movement.

9. Physical characteristics

Form:	Flexible tube or sheet. Foamed with closed cell structure.
Auto-ignition temperature:	Above 250 °C.
Volatile organic content:	Nil.

HT ARMAFLEX

SAFETY DATA SHEET

10. Stability and Reactivity

Avoid contact with oxidising agents and strong acids, can react violently.

11. Toxicological Information

Inhalation:	See under heading 4 – First Aid Measures.
Eye contact:	See under heading 4 – First Aid Measures.
Skin contact:	Not harmful.

12. Long term hazards

Non identified.

13. Ecological Information

Does not evolve gases which will damage the ozone layer, add to global warming, or contribute to ground level ozone pollution.

14. Disposal Considerations

Product may be disposed of as normal industrial waste.

15. Transport Information

No special precautions required.

16. Regulatory Information

None.

17. Other Information

Information on Armacell Safety Data Sheets is drawn from a variety of sources, including raw materials suppliers data, and other published sources. Occupational Exposure Limits, where applicable, are taken from HSE Guidance Note no. EH40/01.

SAFETY DATA SHEET

according to 91/155/EEC

Armaflex Adhesive HT 625

Replaces 01.03.2002

REG.-NR. D 3884
STATUS: 10.13.2003
PAGE: 1 (of 8)

1 MATERIAL/PREPARATION AND COMPANY NAME

TRADE NAME: Armaflex Adhesive HT 625

USE: For treatment of Armacell insulation material of elastomeric foam based on synthetic rubber

SUPPLIER:
Armacell LLC
7600 Oakwood St. Ext
Mebane, NC 2730
Phone: (919) 304-3846
Fax: (919) 304-3847

INFORMING DIVISION: Area raw material and environmental process IPO

EMERGENCY INFORMATION: EMERGENCY ONLY CONTACT: CHEM-TEL 800-255-3924

2 COMPOSITION AND DETAILS OF CONSTITUENTS

CHEMICAL CHARACTERISATION DESCRIPTION: solvent containing adhesive

HAZARDOUS CONTENTS:

CAS-No.	Name	%	Code letter	R ratio
141-78-6	Ethylacetate	25-50	Xi	36-66-67
110-82-7	Cyclohexane	25-50	Xi	38-67
142-82-5	Heptane	1-5	Xi	38-67
67-64-1	Acetone	5-25	Xi	38-67-66
203-777-6	Mixture of isomers less than 5% n-Hexane	5-25	X	38-67
110-54-3	Mixture of isomeres More than 5% n-Hexane	1-5	Xi	38-67 51/53-65-67

3 POSSIBLE HAZARDS

TYPE OF HAZARD:	highly flammable irritating to eyes and skin
CLASSIFICATION SYSTEM:	The classification corresponds to the latest EC lists, though it is supplemented by information from technical literature and company information.
ADDITIONAL INFORMATION:	With usage the generation of explosive/easily flammable steam-air-mixtures is possible.

4 FIRST AID MEASURES

AFTER INHALATION:	Supply of fresh air, consult doctor in the event of complaints Taking to stable side position at unconsciousness.
AFTER SKIN CONTACT:	Wash with soap and plenty of water
AFTER EYE CONTACT:	Rinse eyes under running water for 10-15 minutes with eyes open. Consult doctor if symptoms persist.
AFTER SWALLOWING:	Consult doctor immediately

5 FIRE FIGHTING MEASURES

SUITABLE EXTINGUISHING MEDIA:	CO_2, extinction powder or water spray jet. Fight larger fires with water spray jet or alcohol resistant foam
UNSUITABLE EXTINGUISHING MEDIA FOR SAFETY REASONS:	Water in full jet.
SPECIAL RISKS:	May form explosive vapour-air mixtures

6 ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Wear safety equipment. Keep unprotected persons away.Do not inhale vapours.Keep away from ignition sources.Ventilate area

ENVIRONMENTAL PRECAUTIONS
Do not allow the product to enter drains or water.
Prevent penetration into sewage systems, water, pits and cellars. Inform pertinent authorities if product enters water or drains.

CLEANING/ABSORTION PROCEDURE: Soak up with absorbent material (sand, diatomite, acid binder, universal binder, sawdust). Ensure adequate ventilation.

ADDITIONAL INSTRUCTIONS: Vapours of organic solvent composition will be set free.
Keep away from sources of ignition.

7 HANDLING AND STORAGE

HANDLING
TIPS FOR SAFE WORKING: Ensure good ventilation/extraction at place of work. Avoid the formation of aerosols.

Tips for fire and explosion protection: Keep away from sources of ignition - no smoking. Take precautions against electrostatic charging. Vapours can form with air an explosive mixture.

REQUIREMENTS ON STORAGE ROOMS AND CONTAINERS: Store in a cool place.

JOINT STORAGE DETAILS: keep away from food

FURTHER INFORMATION ON STORAGE CONDITIONS: Keep containers tightly closed. Store cool and dry in well sealed containers. Keep away from heat and out of direct sunlight.

VCI-CLASS: 3A

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

ADDITIONAL INFORMATION ABOUT
ENGINEERING MEASURES: Provide adequate ventilation.Suitable respiratory protection must be worn if the concentration of solvent vapor is not below the limits

CONSTITUENTS WITH LOWER THRESHOLD LIMIT VALUES:

CAS-No.	Name of material	Category	Type	Limit-Value Unit
110-82-7	Cyclohexane	4	TRGS 900	700 mg/m³, 200 ppm
141-78-6	Ethyl acetate	1	TRGS 900	1400 mg/m³; 400ppm
67-64-1	Acetone	1	TRGS 900	1200 mg/m³; 500 ppm
142-82-5	Heptane	4	TRGS 900	2000 mg/m³, 500 ppm
110-54-3	Mixture of isomeres More than 5% n-Hexane	4	TGRS 900	180/m³, 50 ppm
203-777-6	Mixture of isomeres less than 5% n-Hexane	4	TRGS 900	720mg/m³ 200ppm

ADDITIONAL INFORMATION: Those lists valid at the time of publication served as a basis.

PERSONAL PROTECTIVE EQUIPMENT
GENERAL SAFETY AND HYGIENE MEASURES: Take notice of usual safety measures when handling with chemical products. Wash hands before breaks and at the end of work. Keeping food, drinks and feed separate. Avoiding touch with the eyes and the skin. Moving immediately clothing and soiled watered.
Do not eat,drink or smoke during work

RESPIRATORY EQUIPMENT: Looking after sufficient ventilation. Breathing equipment independent of circulating air during intensive and longer exposure and spraying is required

HAND PROTECTION: It is advisable to wear solvent-resistant protective gloves.
EYE PROTECTION: Close-fitting safety goggles

12 ECOLOGICAL INFORMATION

GENERAL DETAILS:	Water hazard class 1 Do not allow undiluted or large amounts to enter groundwater, water or drains. Dangerous for drinking-water if less quantity runs out in the underground.

13 DISPOSAL CONSIDERATIONS

PRODUCT RECOMMENDATION:	Uncured product: special waste Cured product : household garbage or trade garbage – observe local regulations
Waste key number:	EWC 08 04 06 Adhesive and sealants not containing halogenated solvent.
DIRTY PACKAGING RECOMMENDATION:	Contaminated packaging must be emptied of all residues. Packaging with traces of cured product may be snet to a recycling plant.Packaging with uncured product must be disposed of in the same manner as the medium

14 TRANSPORT INFORMATION

LAND TRANSPORT ADR/RID AND GGVS/GGVE (ACROSS BORDERS/DOMESTIC)

ADR/RID-GGVS/E CLASS:	3 Inflammable liquid
NUMBER/LETTER:	5 b
KEMLER NO.:	33
UN NUMBER:	1133
TREMCARD:	3
Margin-Number:	2301
NAME OF PRODUCT:	Adhesive

MARITIME TRANSPORT IMDG/GGVSee

IMDG/GGVSEE CLASS:	3.2
PAGE:	3174
UN NUMBER:	1133
PACKAGING GROUP:	II
Tremcard:	3
EMS-NUMBER:	3-05

SAFETY DATA SHEET
according to 91/155/EEC

Armaflex Adhesive HT 625
Replaces 01.03.2002

REG.-NR. D 3884
STATUS: 10.13.2003
PAGE: 7 (of 8)

MFAG:	330
CORRECT TECHNICAL NAME:	Adhesive
COMMENTS:	Adhesive is not a maritime pollutant

AIR TRANSPORT ICAO-TI AND IATA-DGR

ICAO/IATA CLASS:	3
UN/ID NUMBER:	1133
PACKAGING GROUP:	II
Tremcard:	3
CORRECT TECHNICAL NAME:	Adhesive

15 REGULATORY INFORMATION

CLASSIFICATION ACCORDING TO EEC DIRECTIVES: Danger symbol and danger designation

F	highly flammable
Xi	irritant

R -PHRASES:

11	highly flammable
36/38	irritating to eys and skin

S -PHRASES:

51	use only in well-ventilated areas
16	Keep away from sources of ignition - no smoking.
24/25	Avoid contact with eyes and skin
26	In case of contact with eyes, rinse immeadiately with plenty of water and seek medical advice.
29	Do not empty into drains.
33	Take precautionary measures against static discharges.

NATIONAL REGULATIONS:
CLASSIFICATION ACCORDING TO VBF: A I
EMISSION CONTROL ACT (TA-LUFT):

Sum organic substances	CLASS 2:	5 – 10 %
	CLASS 3	70-75 %

SAFETY DATA SHEET
according to 91/155/EEC

Armaflex Adhesive HT 625
Replaces 01.03.2002

REG.-NR. D 3884
STATUS: 10.13.2003
PAGE: 8 (of 8)

WATER POLLUTION CLASS: WGK 1
ACCORDING VWVWS

16 FURTHER INFORMATION

R-Phrases of components

36 Irritating to eyes
38 Irritating to skin
66 Repeating exposure may cause skin dryness or cracking
67 Vapours may cause drowsiness and dizziness

This information is based on the latest level of our knowledge, though this does not represent any warranty of product characteristic and establishes no contractual legal relationship.

DIVISION ISSUING DATA SHEET: Technical Department
CONTACT PERSONS: K. A. Patel

END OF SECTION 23 83 00

Division 26: Electrical

Section 26 00 00	Electrical
Section 26 09 00	Instrumentation and Control for Electrical Systems
Section 26 20 00	Low-Voltage Electrical Transmission
Section 26 28 16	Enclosed Switches and Circuit Breakers
Section 26 31 00	Photovoltaic Collectors
Section 26 33 13	Batteries

PART 1 - GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Qualities: Electricity provides clean, efficient power at point of use.
B. Problems: Fuel supplies for electric power are petrochemical and nuclear. Generating and transmission inefficiencies make electric power less efficient than direct consumption of fuel source. Incandescent lighting converts only 10 to 15% of electricity into light. Older fluorescent lights contain less-efficient magnetic ballasts and can cause humming and flickering (may affect occupant health and productivity). Lights are often left on when not in use (consumes energy).
C. Recommendations: Select renewable energy sources for electric power generation. Select local and site-generated power sources (distributed power). Select electronically ballasted fluorescent light fixtures. Select LED (light-emitting diode) light source for low-lumen applications, such as exit signs. Utilize automatic lighting controls to limit unnecessary use of electric lighting.

PART 2 - PRODUCTS

2.1 ELECTRIC POWER GENERATION

Fuel Cells:
Polymer exchange membrane
Phosphoric acid
Hydrogen
Wind Turbine Generators
Generators [High-mass generators designed to operate at lower speeds preferred for durability and low-maintenance]
Towers [Wind speed and consistency tend to increase with height.]
Microturbines [Relatively low efficiency unless waste heat is utilized in combined heat and power (cogeneration) application]
Photovoltaic Systems, including building-integrated (BIPV) [see Section 13600]
Light Sensors

2.2 LAMPS

Fluorescent Lamps: T12 Lamp, T8 Lamp, T5 Lamp
Mercury: Nonleachable form. Reduced mercury content
Efficacy: T5 - 90 to 100 lumens/watt, depending on wattage
Color Rendering Index (CRI): Minimum 70
Compact Fluorescent Lamps (CFLs): [Equivalent wattages for fluorescent/incandescent lamps: 7W = 25W, 11w = 40W, 15W = 60W, 20W = 75W, 25W = 100W]
Circuline
Folded tube
Twisted tube
Dimmable
5 Color Rendering Index (CRI): Minimum 80
High-Intensity Discharge Lamps: High-bay applications are often better served with high-output T5 fluorescent fixtures.
Metal halide

High-pressure sodium
Mercury vapor (generally not recommended)
Low-pressure sodium (generally not recommended)
Halogen Lamps:
PAR lamp
Low-voltage MR16
Light-Emitting Diodes (LEDs): Primary building use for exit signs

2.3 BALLASTS
Fluorescent Lamp Ballasts
Efficiency: Shall meet or exceed California Energy Commission Requirements
Tandem wiring: Use two lamp ballasts; provide interwiring between fixtures.
Type: [Magnetic ballasts are not allowed.]
Integral ballast for CFL
Modular ballast for plug-in lamp
High-frequency electronic
Power Factor: 90% minimum
High Ballast Factor
Dimmable: 100% -10%
High-Intensity Lamp Ballasts
Power Factor: High, minimum 90%

2.4 LUMINAIRES
Exterior Luminaires: Full-cutoff luminaries, Photovoltaic power source
Lamps: Fluorescent, Metal halide, High-pressure sodium
Exit Signs: Maximum 5 watts per face
Lamps
LED
CFL

2.5 ELECTRIC POWERED TOOLS

A. Chicago Electric Power Tools: 44 lb. Electric Hoist (model 40765)
    1. 220 lb capacity (single cabel), 440 lb capacity (double cable), Line Speed: 33 feet/minute, Cable Length: 38’ single lift, 19’ double lift, Motor: .61 horsepower 1725 RPM, Power supply: 110 V AC, 560 W, 4.5 Amp, 1 phase, 60 Hz, Remote switch: 5.5’ Cable length, Dimensions: 13 ¾” x 5 ½” x 8 ½”, Net Weight: 24.2 lbs

2.6 CONTROLS
Occupancy Sensors: Passive, infrared motion sensor, Ultrasonic sensor
Mounting: Wall, Ceiling
Light Level Controls: [Automated control system computes light levels based on daylight intensity, occupancy sensors, and timed schedules.]

2.7 RELATED MATERIALS
Reflectors: Snap-in-place reflectors

2.8 MORE PRODUCTS

OutBack PS2/PS4 Breakers

OutBack AC Breakers

Hydraulic-Magnetic type breakers that are DIN rail "snap-in" mountable and can be used for input, output or load circuits. 1/2" (13 mm) wide.

OutBack AC Breaker Specifications

Model	Rating	Version	Width
OBAC-50	120VAC	Single Pole	0.5" (13 mm)
OBAC-50D	120/240VAC	Dual Pole	1.0" (26 mm)
OBAC-50-3P	120/208VAC	Three Pole	1.5" (39 mm)
OBAC-50DE	240VAC	Dual Pole	1.0" (26 mm)
OBAC-30	120VAC	Single Pole	0.5" (13 mm)
OBAC-30D	120/240VAC	Dual Pole	1.0" (26 mm)
OBAC-25D	120/240VAC	Dual Pole	1.0" (26 mm)
OBAC-20	120VAC	Single Pole	0.5" (13 mm)
OBAC-20D	120/240VAC	Dual Pole	1.0" (26 mm)
OBAC-15	120VAC	Single Pole	0.5" (13 mm)
OBAC-15D	120/240VAC	Dual Pole	1.0" (26 mm)

OutBack DC Breakers

Panel mounted Hydralic-Magnetic type breakers which can be used for DC sources, inverters or load circuits. 3/4" (18 mm) wide.

OutBack DC Breaker Specifications

Model	Current Rating	Stud Terminal Size	Width
OBDC-250	250 amp 125 VDC	3/8 " stud	1.5" (39 mm)
OBDC-175	175 amp 125 VDC	3/8" stud	1.5" (39 mm)
OBDC-125	125 amp 125 VDC	5/16" stud	1.0" (26 mm)
OBDC-100	100 amp 125 VDC	5/16" stud	1.0" (26 mm)
OBDC-80	80 amp 150 VDC	5/16" stud	0.75" (19 mm)
OBDC-70	70 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-60	60 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-50	50 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-40	40 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-30	30 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-20	20 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-15	15 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-10	10 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-5	5 amp 150 VDC	1/4" stud	0.75" (19 mm)
OBDC-1	1 amp 150 VDC	1/4" stud	0.75" (19 mm)

You Will need Adobe Acrobat 5.0 or later to View our PDF's

Acrobat files can be read on your computer screen or printed using an Adobe Acrobat Reader available free from Adobe

Get Acrobat

OutBack PV Ground Fault Protection System

The OBDC-GFP/2 is required by the NEC for PV arrays mounted on residential dwelling roofs. It can be used with the PS2DC, PS4DC or PS1. An OBDC-GFP/2 protects wiring and system components for one or two PV arrays: dual 80 amp PV circuits 150 VDC max VOC. The OBDC-GFP/2 system includes the GFP unit, a ground bus bar, neutral and ground connection wiring and mounting hardware.

OutBack PV Ground Fault Protection Specifications

Model	Description	Stud Terminal Size
OBDC-GFP/2	80 amp at 150 VDC	2 Poles - Requires 3

Outback Power Systems Inc © 2004 | 19009 62nd Ave NE Arlington WA, 98223 | Phone 360-435-6030 | Fax 360-435-6019
Comments? email the webmaster

OutBack PSPV Breakers & Fuses

Photovoltaic (PV) Array Breakers

PV breakers are Hydraulic-Magnetic type and are not affected by high ambient temperatures. All breakers have a 10 year warranty. Maximum of twelve OBPV in one PSPV enclosure.

PV Array Breakers Specifications

Model	Rating
OBPV-2	2 amps 150 VDC
OBPV-4	4 amps 150 VDC
OBPV-6	6 amps 150 VDC
OBPV-8	8 amps 150 VDC
OBPV-9	9 amps 150 VDC
OBPV-10	10 amps 150 VDC
OBPV-15	15 amps 150 VDC
OBPV-30	30 amps 150 VDC

PV Array Fuses and Fuse Holders

DIN rail snap-in mount with #8 AWG setscrew type compression terminals. Touch-safe design. Not rated for load make or load break usage. UL listed for up to 600 VDC. Maximum of eight fuse holders in one PSPV enclosure.

PV Array Fuses Specifications

Model	Description
OBFH	Fuse Holder only
OBF-6	6 amp 600 VDC
OBF-10	10 amp 600 VDC
OBF-15	15 amp 600 VDC

Terminal and Ground Bus Bars

Use for adding more wire terminations or for isolating multiple positive / negative circuits. Has three #1/0 to 14 AWG and eight #6 to 14 AWG screw type compression terminals, which means no

OutBack PSPV Breakers & Fuses

Photovoltaic (PV) Array Breakers

PV breakers are Hydraulic-Magnetic type and are not affected by high ambient temperatures. All breakers have a 10 year warranty. Maximum of twelve OBPV in one PSPV enclosure.

PV Array Breakers Specifications

Model	Rating
OBPV-2	2 amps 150 VDC
OBPV-4	4 amps 150 VDC
OBPV-6	6 amps 150 VDC
OBPV-8	8 amps 150 VDC
OBPV-9	9 amps 150 VDC
OBPV-10	10 amps 150 VDC
OBPV-15	15 amps 150 VDC
OBPV-30	30 amps 150 VDC

PV Array Fuses and Fuse Holders

DIN rail snap-in mount with #8 AWG setscrew type compression terminals. Touch-safe design. Not rated for load make or load break usage. UL listed for up to 600 VDC. Maximum of eight fuse holders in one PSPV enclosure.

PV Array Fuses Specifications

Model	Description
OBFH	Fuse Holder only
OBF-6	6 amp 600 VDC
OBF-10	10 amp 600 VDC
OBF-15	15 amp 600 VDC

Terminal and Ground Bus Bars

Use for adding more wire terminations or for isolating multiple positive / negative circuits. Has three #1/0 to 14 AWG and eight #6 to 14 AWG screw type compression terminals, which means no

ring lugs required.

Terminal and Ground Bus Bars Specifications

Model	Description
TBB	Terminal Bus bar with black insulators
GBB	Ground terminal Bus bar

You Will need Adobe Acrobat 5.0 or later to View our PDFs

Acrobat files can be read on your computer screen or printed using an Adobe Acrobat Reader available free from Adobe

Get Acrobat

Outback Power Systems Inc © 2004 | 19009 62nd Ave NE Arlington WA, 98223 | Phone 360-435-6030 | Fax 360-435-6019 | Comments? email the webmaster

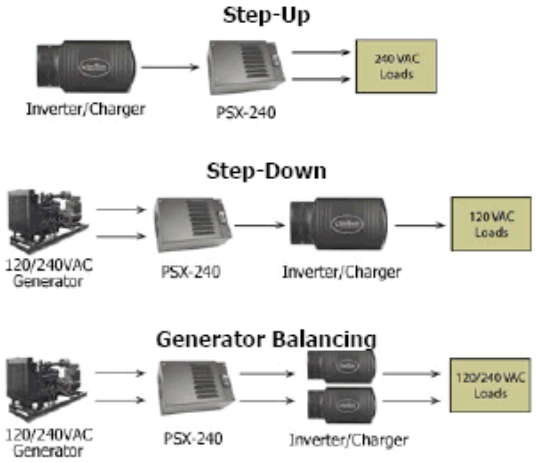
PSX-240 Auto Transformer

PSX-240

The OutBack PSX-240 auto transformer can be used for step-up, step-down, generator and split phase output balancing or as a series stacked inverter to load balancing auto-former. Incorporating a transformer with 120 volt/30 amp primary and secondary side, a temperature activated cooling fan and a 25 amp dual breaker in a steel enclosure, the PSX-240 is ready to install in your custom application. Use for 120 or 240 VAC 60 Hz systems only.

Powering 240 volt items like deep well pumps with a single 120 volt inverter is possible thanks to the PSX-240's step-up capability. Its step-down feature allows you to charge your batteries with a 240 volt generator through a single 120 volt inverter. The PSX-240's ability to balance the output of series stacked inverter/chargers makes it a critical item when using the OutBack stacking 120/240 VAC configuration.

The X-240 is also available without the enclosure, for installation inside the PS2AC or PS4AC enclosures.

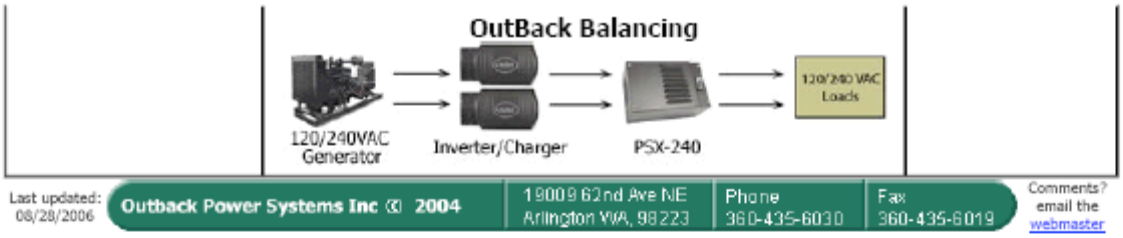


OutBack Balancing? What do we mean. Read about it Here

You Will need Adobe Acrobat 5.0 or later to View our PDF's

Acrobat files can be read on your computer screen or printed using an Adobe Acrobat Reader available free from Adobe

Get Acrobat



Last updated: 08/28/2006
Outback Power Systems Inc © 2004
19009 62nd Ave NE Arlington WA, 98223
Phone 360-435-6030
Fax 360-435-6019
Comments? email the webmaster

Power packs, slave packs & supplies

Watt Stopper power packs provide 24VDC operating voltage to sensors and are capable of switching up to 20 Amps of ballast load at 120 and 277 VAC. Slave packs are identical to power packs but have no transformer power supply

Power packs consist of a transformer and a high-current relay combined in one small package. The transformer has a primary high voltage input and a secondary 24VDC, 150mA output. The secondary voltage provides operating power to Watt Stopper sensors. When the occupancy sensors detect motion, they electrically close an internal circuit which sends 24VDC back to the power pack which controls the lights.

Power packs are are housed in ABS, UL rated 94V-0 plastic enclosures. A snap-in nipple on the power pack mounts to standard electrical enclosures with 1/2 inch knockouts.

Features (B series)

- Self-contained transformer relay system
- Easy snap-in installation
- Secondary voltage: 24 VDC
- Secondary output: 150mA before relay is closed
- Switches up to 20 Amps of electrical load
- Enclosure: UL rated 94V-0 plastic enclosure
- Units are white
- Low voltage leads rated for 300 volts
- 1.75" x 2.75" x 1.5" (45mm x 70mm x 38mm)

Order Information

		LOAD RATINGS			
CATALOG #	INPUT VOLTAGE	BALLAST(A)	INCAN(A)	MOTOR(HP)	OUTPUT
Power Pack					
B120E-P	120VAC, 60Hz	20	13	1	24VDC, 150mA
B277E-P	277VAC, 60Hz	20	-	-	24VDC, 150mA
B230E-P	220-240VAC, 50/60Hz	20	13	1	24VDC, 150mA
B347D-P	347VAC, 60Hz	15		-	24VDC, 150mA
Slave Pack					
S120/277/	120/277/347VAC	20/20/15	13/-/-	1/-/-	-
347E-P					
Form C Power pack					
A120C-P**	120VAC, 60Hz	6NO/3NC	5NO/3NC	1NO/2.5NC	24VDC, 100mA
A277C-P**	277VAC, 60Hz	6NO/3NC	5NO/2.5NC	2NO/.5NC	24VDC, 100mA
2 Relay Power Pack					
C120E-P	120VAC, 60Hz	20*	13*	1*	24VDC, 150mA
C277E-P	277VAC, 60Hz	20*	-	-	24VDC, 150mA
Power Supply					
AT-120	120VAC, 60Hz	-	-	-	24VDC, 800mA
AT-277	277VAC, 60Hz	-	-	-	24VDC, 800mA

* Ratings per relay ** Contain an isolated relay with normally open (NO) and normally closed (NC) contacts

EW Low Voltage Outdoor Motion Sensor

PROJECT
LOCATION/TYPE

Product Overview

Description

Watt Stopper/Legrand's EW outdoor motion sensors provide occupancy based control of outdoor lighting. Raintight and rated for -40°F to 130°F, EW sensors perform reliably in all weather conditions.

Operation

EW sensors operate at 24 VDC and are mounted onto a standard, outdoor junction box. Utilizing advanced PIR technology, the sensors detect the difference between infrared energy in motion and the background space to turn lighting on when a person or vehicle enters the coverage area. After the area is vacated and the time delay elapses, lighting automatically turns off. The EW's dual PIR detectors and three level lens increase the detection density as well as the accuracy of motion detection.

Applications

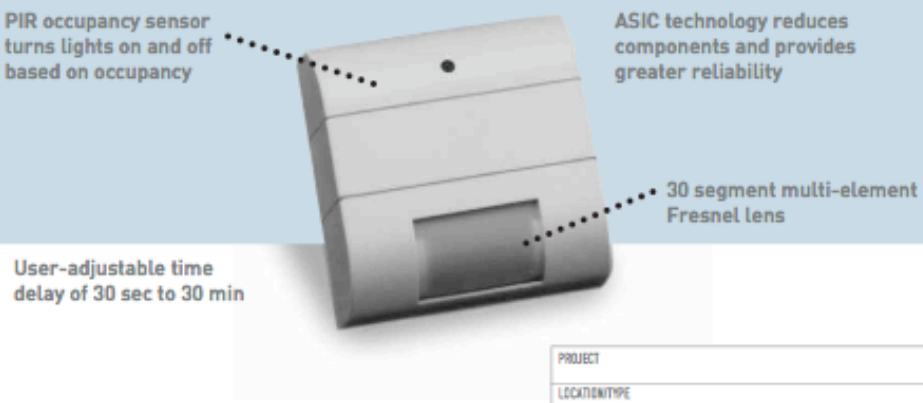
The low voltage EW sensors are ideal to use in conjunction with Watt Stopper DM-105-WP outdoor HID control module. Here, the EW allows the outdoor HID lighting to switch between high and low based on motion detection. Applications include walkways, parking lots, dock lighting and warehouses. When used with a power pack, the low voltage EW also provides an outdoor lighting control solution for areas where line voltage is not available or where the load is too large for a single line voltage sensor to handle.

Features

- Sensors can be mounted on walls, eaves, or ceilings for installation convenience
- 180° or 270° coverage patterns
- Front rotates for easy coverage adjustment
- Precision, double-shot tooling with internal silicon gaskets prevents water and dust contamination
- Optional override-ON to turn lights on remotely for the length of the time delay
- User-adjustable time delay from 12 seconds to 16 minutes
- Adjustable light level setting allows users to set the level at which lighting will turn on upon occupancy
- ASIC enhances reliability and helps to eliminate false triggers
- Pulse Count Processing eliminates false triggers and provide RFI and EMI immunity
- Includes hardware for mounting sensor to standard 4" round outdoor junction box

Occupancy Sensors

WPIR Passive Infrared Occupancy Sensor



PROJECT

LOCATION/TYPE

Product Overview

Description

The WPIR is a versatile ceiling mount passive infrared occupancy sensor that turns lights on and off based on occupancy. The WPIR controls lighting in a wide variety of applications, but is especially adept at controlling small spaces with well defined coverage.

Operation

When the WPIR sensor detects a change in the infrared heat radiated within the controlled area, lighting (or HVAC) systems are switched ON through a Watt Stopper/Legrand power pack. The 24 VDC sensor controls the power pack through low voltage wiring. When occupants leave the area, lighting is switched OFF after the user-adjustable time delay elapses.

Fresnel Lens and Coverage

The WPIR is equipped with a multi-element Fresnel lens that allows the sensor to efficiently collect infrared energy and provides optical gain over a defined field of view. The profile of each groove facet is determined by computer simulation to produce the sharpest images possible from a distant object. The use of a 30 segment lens allows overlapping coverage within the defined field of view. The coverage is partially determined by the view available to the sensor. Mounted to a wall, the WPIR will produce a completely different viewing pattern. Zone 4 and 5 (see diagram on back) are then capable of sensing up to 45 feet.

Applications

The WPIR can effectively cover small offices, utility areas, or computer rooms. Additional applications include racquetball courts, garage areas, library aisle ways, and storage rooms.

Features

- ASIC technology enhances reliability; provides immunity to RFI and EMI
- Uses passive infrared (PIR) technology to reliably control lighting in a variety of applications
- User-adjustable time delay of 30 seconds to 30 minutes
- A "daylight" filter ensures that the device will be insensitive to short-wavelength infrared waves such as those emitted by the sun
- A multi-element Fresnel lens allows the sensor to efficiently collect infrared energy and provides optical gain over a defined field of view
- Alternate viewing patterns depending on mounting choice
- Optional ON override through logic key/ON bypass
- LED indicates occupancy detection

WattStopper
legrand
www.wattstopper.com
800.879.8585

OCCUPANCY SENSORS | Wall Switches

PW-100 Passive Infrared Wall Switch Sensor

PROJECT

LOCATION/TYPE

Product Overview

Description

The PW-100 passive infrared (PIR) wall switch sensor turns lights ON and OFF based on occupancy. It is characterized by high sensitivity to small and large movements, appealing aesthetics, and variety of features.

Operation

The PW-100 replaces existing wall switches and fits in a single gang junction box. It uses advanced PIR technology to detect occupancy and turns lighting ON. Once the space is vacated and the time delay elapses, lights automatically turn OFF. DIP switch settings allow for a variety of control options such as Auto-ON or Manual-ON operation, walk-through, and test modes.

SmartSet™

Using SmartSet technology, the PW-100 continuously monitors the controlled space to identify usage patterns and automatically adjust the time delay for optimal energy efficiency. The sensor assigns short delays (as low as seven minutes) for times when the space is usually vacant, and longer delays (up to 30 minutes) for busier times. SmartSet is also able to differentiate electrical noise from human motion for greater performance.

Applications

The PW-100 sensor is well suited for small, enclosed spaces with clear line of sight of the occupant. Common applications include small office, small conference room and lunch/break rooms.

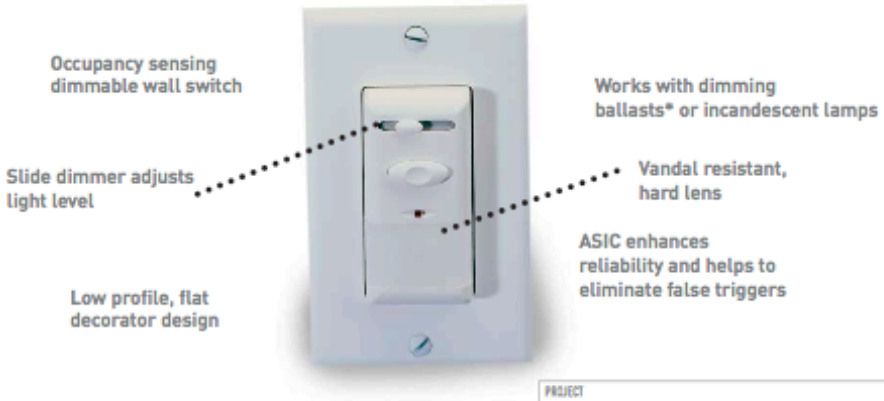
Features

- Detection Signature Processing eliminates false triggers and provides immunity to RFI and EMI
- Zero-crossing for long relay life
- Vandal resistant lens combines precise coverage with durability
- Choice of Auto-ON or Manual-ON operation
- Selectable SmartSet automatically adjusts time delay for maximum savings
- Selectable walk-through mode turns lights off three minutes after the room is initially occupied if no motion is detected after the first 30 seconds
- Selectable test mode allows quick and easy adjustments
- Selectable audible and/or visual alerts for impending shutoff
- In automatic mode, sensor returns automatically to Auto-ON after lights are turned off manually; ideal for presentations
- LED indicates occupancy detection
- Features built-in light level sensing with simple, one-step setup
- Override mode allows sensor to operate as a service switch in the unlikely event of a failure
- NEMA WD 7 guideline utilized for coverage testing

WattStopper legrand
www.wattstopper.com
800.879.8585

OCCUPANCY SENSORS | Wall Switches

WD Passive Infrared Dimmable Wall Switch Sensor



PROJECT

LOCATION/TYPE

Product Overview

Description

The WD sensors are decorator style, dimmable automatic wall switches. They replace standard wall switches and work with fluorescent fixtures using ballasts with line voltage phase control input or Advance® Mark X™ electronic dimmable ballasts as well as incandescent fixtures.

Operation

The WD sensors use passive infrared (PIR) technology to turn lights on when the controlled space is occupied. The WD-170 and WD-180 automatically turn off once the space is vacated and the user-adjustable time delay elapses. The WD-270 and WD-280 have a dim-before-disconnect feature where once the space is vacated and the fixed 15 minute time delay elapses, lights dim to the minimum level. Then, lights turn completely off after a secondary, adjustable time delay. For all models, lights can be turned off manually by pressing the auto/off button.

Dimming Feature

The WD's slide dimmer adjusts the lighting from a minimum of 10% to a maximum of 100%. The position of the slide dimmer determines the light level that turns on upon occupancy. The combination of dimming and occupancy sensing provides a high degree of energy savings, as well as enhanced user control over the lighting environment.

Applications

The WD can be used in many spaces including private offices, small conference rooms, and copy rooms. Offices in public spaces can also use the WD because of the vandal resistant hard lens. The product's flat, low-profile appearance adds to the aesthetics in any location.

Features

- ASIC technology reduces components and enhances reliability
- Pulse Count Processing eliminates false offs without reducing sensitivity
- Detection Signature Analysis eliminates false triggers; provides immunity to RFI and EMI
- Hard lens makes the unit resistant to vandalism
- Zero Voltage Turn ON/OFF increases life of sensor
- Line voltage dimmable; does not require extra control wiring to the ballast for the dimming function
- Patented voltage drop protection
- For safety, there is no leakage to load in the off mode and sensor is safety grounded
- LED indicates occupancy detection

*Compatible with electronic dimming ballasts with line voltage phase control input as well as with incandescent fixtures

WattStopper | legrand

www.wattstopper.com
800.879.8585

CI-12 (12 VDC)
CI-24 (24 VDC)

< Back to top

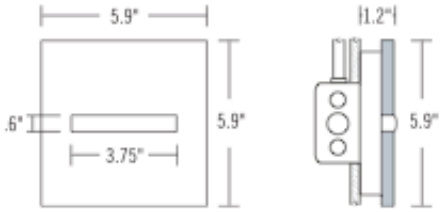
- Ceiling mount PIR occupancy sensor
- 360°, 1200 sq ft coverage
- Interfaces directly with EMS or HVAC system through an
- internal isolated relay
- Low-profile design
- DIP switch adjustable sensitivity, time and override
- High immunity to RFI and EMI

< Back to top

- Dual-element, temperature compensated pyroelectric sensor
- Operates at 12 VDC (CI-12); 24 VAC or 24 VDC (CI-24)
- Pulse Count Processing eliminates false offs without reducing sensitivity
- Detection Signature Analysis eliminates false triggers; provides immunity to RFI and EMI
- Digital time delay adjustment from 30 seconds to 30 minutes
- Red LED indicates occupancy detection
- 3.3" diameter x 2.2" deep (85mm x 56mm), extends approximately 0.36" from ceiling
- Multi-level Fresnel lens for superior desktop detection

plane

step light



Application
These configurations of the **plane** step light offer a variety of different color combinations for edge glow accents and functional pathway lighting. For use in exterior and interior architectural applications.

- **plane** mounts directly to a junction box for wall mount applications. UL Listed for wet / damp locations. Refer to page 14 for mounting details.

Light Output
plane delivers illuminance levels that exceed the National Electrical Codes (NEC) requirement for emergency egress. Recommended mounting 18" to 24" A.G. IES format photometric data available on io's website.

Construction
Environmentally sealed, enclosed and gasketed 5.9" sq. corrosion resistant zinc casting (stainless steel optional). Mounts directly to a UV stable, optically clear, high strength polycarbonate housing. LED luminaire modules contained within the housing are replaceable.

Electrical
120V or 277V energy saving current limiting Class 2 power supply (driver) is located within a 1 1/2" or 2 1/8" deep, 4" octagonal junction box. Emergency battery back up requires a 4" square, 2 1/8" deep junction box.

Power Consumption
- standard: 9.75 w

Step Optic
Precision molded polycarbonate lens with superior optical properties offers a 90° cutoff with a 70% fixture efficiency.

Finish
Zinc face plate may be polyester powder coated or plated. Plated finishes are for interior applications only. Face plate may also be specified in stainless steel.

Emergency
Bodine's AC/Emergency LED driver, "Odyssey," has been designed for the **plane** step light specifically.

The center portion of the **plane** step light will illuminate for 90 minutes at full light output during emergency operation. This combination driver/battery back-up must be installed in a standard 4" square, 2 1/8" deep junction box. **plane** mounts directly to this junction box with an io supplied mounting bracket. A single-pole push-button test switch and LED charging indicator light are also provided. See page 14 for further details.

c UL us
ADA Compliant

370 Corporate Woods Pkwy Vernon Hills, IL 60061-3107
T 847.735.7000 F 847.735.7001 E info@iolighting.com W iolighting.com

LOOK WALL LIGHT:
Designed by Proli Diffustion Studio
Satin nickel metal frames
Suitable for bathroom applications

Forecast Lighting Wishes Contemporary Mini Pendant Light Fixture - FOR-F5100-WISHES

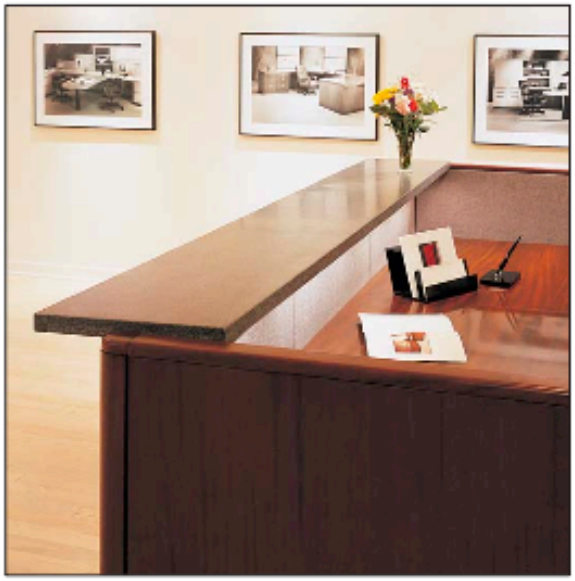
Wish for nothing more than a simple stylish glow with the Wishes mini pendant light fixture, with a curved handcrafted glass shade available in White, Amber, Blue, or Red Cirrus, and versatile canopy options in Satin Nickel, White, and Black.

- 5.5" Width | 8.5" Height | 120" Maximum hang from ceiling
- Uses (1) 75 watt incandescent bulb (not included)
- 10' cable (clear, white, or black depending on canopy choice) included

ALKCO

TASK LIGHTING A1.0

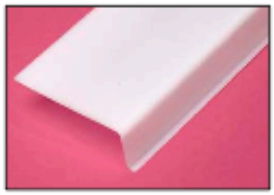
LITTLE INCH
MINIATURE FLUORESCENT UNDERCABINET FIXTURE HP 100/200 SERIES



- Class "P" high performance ballast instantly starts lamps without flicker and operates cooler/quieter/more efficiently than conventional pre-heat systems.
- No external replaceable starter to malfunction or wear out.
- Post fabrication painting eliminates raw edges which can rust or cause injury.
- Industry exclusive life-time guarantee.
- Extremely thin 1" profile.
- Available in various lengths with standard, premium and high output lamps.
- Quick installation and easy maintenance with hinged wireway.
- Flush ends allow row mounting for continuous illumination.
- Choose translucent lens for diffuse illumination or opaque front task lens for 30% more footcandles without direct edge-glare. Both are pliable Alkcorylic™, guaranteed not to discolor.

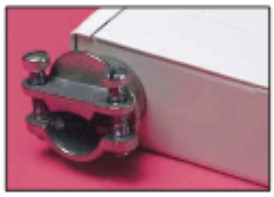
The Little Inch is a superior quality miniature fluorescent for general use undercabinet lighting in residential, commercial and institutional applications

Hinged wireway



Snap-in translucent diffuser

ALKCO LIFETIME WARRANTY Little Inch



Greenfield/romex connector

LITECONTROL

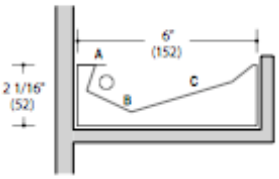
Type:
Project:

Cove-25™

CC-AI-2500

Concealed Cove System

Specifications



A Luminance Control Deflector™ minimizes socket shadows.

B High-reflectance aluminum for maximum horizontal light projection.

C High-reflectance white reflector for efficient indirect distribution.

HOUSING. Die-formed steel. Paint finish is baked white enamel. Ends provided with 7/8" diameter hole to accommodate pre-wiring.
REFLECTORS. Angled reflector is die-formed high-reflectance aluminum, precisely shaped for maximum horizontal light projection. Straight sloped reflector is 24-gauge steel, finished in high-reflectance white for maximum indirect light distribution. Luminance Control Deflector™ (LCD), finished in high reflectance white, reduces wall brightness directly above fixture and minimizes socket shadows between fixtures.
LAMPING. Available in one-lamp T5 or T5HO.
BALLAST. Low-profile Electronic Ballast (**LP/ELB**), high power factor, thermally protected Class P, Sound Rated A, less than 10% THD, manufactured by a UL Listed manufacturer, as available, determined by Litecontrol. Ballasts with a voltage range of 120 to 277 will be used when fixture configuration and ballast availability allow. The minimum number of ballasts will be used.
PRE-WIRING. Fixtures are supplied with #12 AWG type THHN wire for branch circuits. One end will have factory-installed push-in quick-connects. The other end will be stripped back 1/2" for quick connection in field. For fixtures to accommodate special circuits such as night light and emergency, etc., in-field wiring will be required. See Pre-Wiring Information for details.
MOUNTING. Fixtures are installed in cove provided by others. See Planning for installation on next page for detailed information.
CERTIFICATION. Fixture and electrical components shall be UL and/or CUL Listed and shall bear the I.B.E.W., A.F. of L. label.

Note: Litecontrol reserves the right to change specifications without notice for product development and improvement.

Ordering guide

Product, lamping, & length

CC -	AI -	25	1	4	T5HO -
Mounting	Distribution	Series	Lamp Count	Nominal Length(ft)	Lamp Type
CC Concealed Cove	**AI** Asymmetric indirect	**25**	**1 →** 1 **1 →** 4 **2 →** 6 **2 →** 8 see **notes**		**T5HO** **T5**

Options

CWM -	LP/ELB -	1CWQ -	LP/EF -	120
Color	Ballast options	Pre-wiring	Other options	Volts
CWM (Matte White) is standard	**LP/ELB** is standard **LPD/ELB** see **Ballast options**	**1CWQ**	**LP/EF** **F** **WKC/WP** **WKC/NP** **AMA5** **AMA10** see **Other options**	**120** **277**

notes:
Lamp Count = total number of lamps in the fixture
For Ordering guide information in shaded areas, choose selection by reading ACROSS the shaded areas for correct specifications.

Cross-section lamping

1-T5 or T5HO

CC-AI-2514T5HO-CWM-LP/ELB-1CWQ-LP/EF-120 is a typical catalog number for a 1-lamp (1 lamp in cross-section), 4-foot long, high-output T5 fixture, Matte White finish, low-profile electronic ballast, pre-wired with single-circuit branch wiring, low-profile emergency fluorescent ballast, 120 volts.

Questions to Ask
1. 120 or 277 volt? **2.** Row information, including desired fixture lengths?
3. Other options?

litecontrol.com

48 DC FLOURESCENT T5 LAMP BALLAST
48 VDC rapid start fluorescent light ballast designed to operate two F54 T5HO (High Output) fluorescent lamps. It features optically isolated electronic ON/OFF control via the standard low voltage RJ11 modular cable. When the inside two wires (red/green) of the RJ11 connector are shorted, the light goes on. When they're opened, the light goes off.
This feature allows for easy remote switching and interfacing with occupancy sensors such as the Sensor DT2-54-R-S-53VDC Switch CM-6-R-NPS.
• DC power to the ballast is never interrupted (unlike conventional AC ballasts that interrupt the power to turn the lights off).
• Designed for optimal performance with the Nextek NPS-1000 Power Gateway, the KT2-54-R-S-53VDC can also be used with any DC power supply within the specified operating voltage range.
• Up to nine KT2-54-R-S-53VDC ballasts may be powered by a single NPS-1000 (eight ballasts if optional storage batteries are used).
• Lighting fixtures can be ordered from light fixture manufacturers with this ballast installed, or it may be installed on-site.
KT2-54-R-S-53VDC Specifications
Operating Voltage: 48 VDC Nominal
Maximum Input Voltage: 60 VDC, Minimum Input Voltage: 42 VDC, Input Current: 2.2 Amps @ 54VDC
VOC: 800V Nominal, VOC to GND: <600V
Ballast Factor: 1
Crest Factor: <1.70
Safety Standards: UL 935
Dimensions: 2.25"W x 1.4"H x 6.25"L(w/flange)
Weight: 2 lbs.
Construction: Aluminum shell with full internal potting seal
Specifications subject to change without notice.
IMPORTANT: Per NEC, the Class CMP or CL2P RJ-11 control wiring must be secured within the fixture to maintain a minimum of 0.25" from power and lamp wiring.

WHITE AND COLOR LED STRIPS:

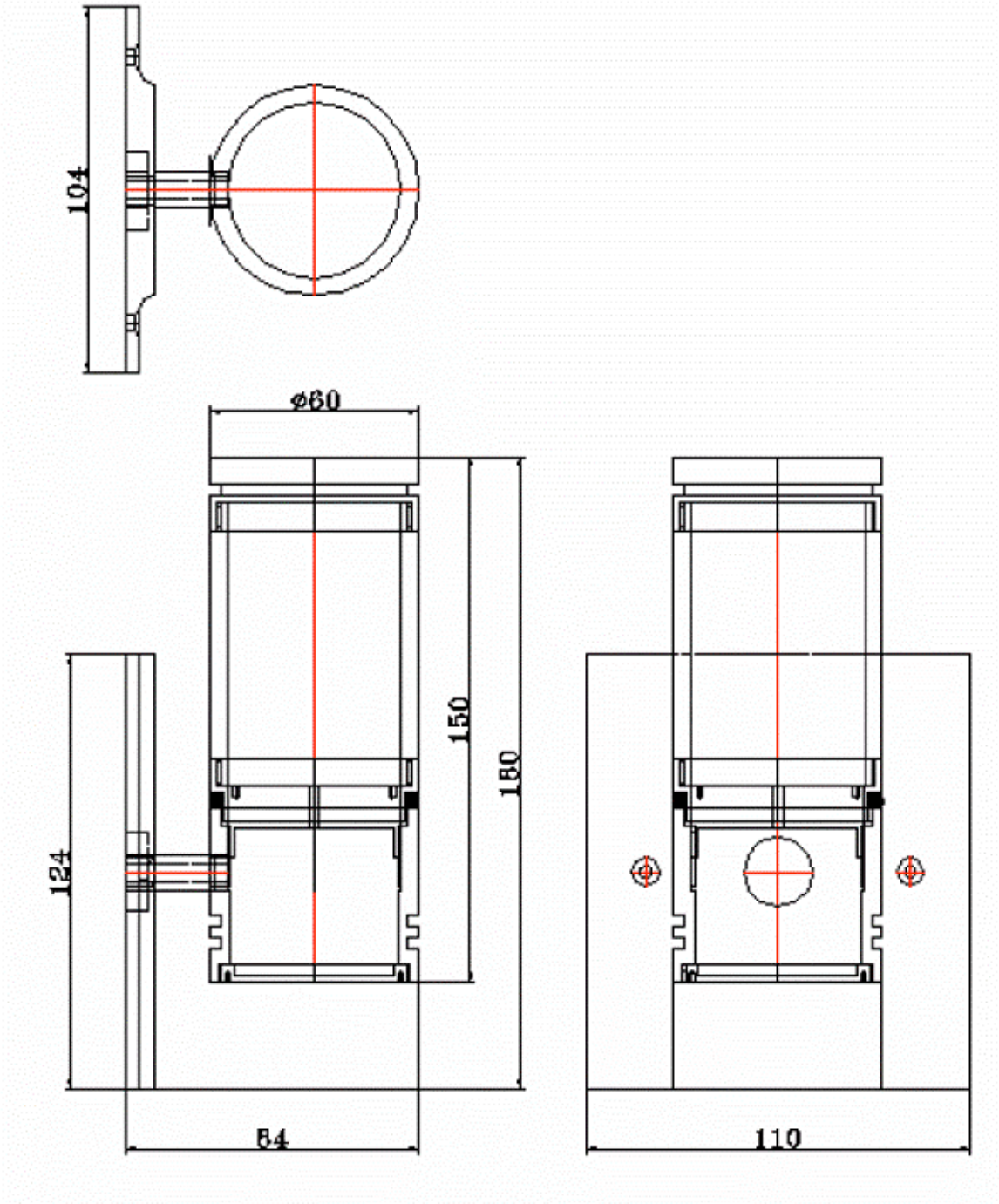
Colored LED Strips are built with 12 ea. surface mount, smd LED. They measure 12" L x 0.825" W and operate on 12 Volts DC. Height of the **LED Strip** is 3/8" w/o the Mounting Track, and 11/16" with the Mounting Track. Unique circuit board design allows for the **LED Strips** to be quickly turned into four 3 inch/3 LED sections or two 6 inch bars with no soldering. Mounting Tracks, Strip Connectors and Power Supply Jumper are also offered. Colored LED LED Strip applications include:

**Channel Letters ** Sign Illumination **Indirect Accent Decor Lighting **Large area Back Lighting **in Cabinets and furniture **Base Board Lighting **Soffit Lights **Wall Sconces **Vehicles

When installing fixtures, arrays, strips, clusters or any LED product which has a total of 60 or more LEDs, always use a dimmer even if you will not use the dimming function. The dimmer contains a PWM/pulse width modulation component which will allow maximum life of the LEDs. **And, if you install more than 6 fixtures with 12**

LED COLOR	Wavelength	Luminous Intensity per LED	Current Draw per 12 Inch Bar	Deg View Angle
White	x=0.24; y=0.23	5000 mcd	107 ma	90°

OUTDOOR LED FLOOD LIGHT



NOTE: All units in mm
12V LED outdoor light
Use two, 3 Watt LEDs
For outdoor use

END OF SECTION 26 00 00

PART 1- GENERAL

1.1 SUMMARY

A. Section includes:
   1. SageGlass® control system for use with SageGlass® electronically tintable insulated glass units.

B. Related Sections:
   1. Section 08 88 00- Special Function Glazing.
   2. Division 25- Integrated Automation.
   3. Division 26- Electrical.

1.2 DEFINITIONS

THE FOLLOWING FRAME WIRE HARNESS EXTENDS PIGTAIL AND CONNECTS TO CENTRAL CONTROL LOCATION.

A. Frame Wire Harness: Wire that runs through framing system and connects IGU pigtail to low-voltage wiring on interior of building.
B. IGU Pigtail: Wire that extends from individual insulated glass units.
C. IGU: Insulated Glass Unit.
D. Tinted: ON state, with lowest visible light transmission.
E. Untinted: Off state, with highest visible light transmission.
F. Wall Station: Wall mounted control interface.

1.3 SUBMITTALS

A. Product Data: Manufacturer's Product Data sheets including installation instructions.

SHOP DRAWINGS NOT PROVIDED BY SAGE ELECTROCHROMICS. THESE NEED TO BE PROVIDED BY OTHERS.

B. Shop Drawings: Indicate wiring diagram, connections to frame wire harnesses, and other related connections. Indicate locations of materials and routing of wiring.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Acceptable to SAGE Electrochromics and capable of preparing data for control systems, based on testing and engineering analysis of SAGE Electrochromics' standard units in assemblies similar to those indicated for this Project.
B. Pre-Installation Meetings: Conduct pre installation meeting or teleconference with the following parties in attendance:
   1. Architect, Contractor, glazing contractor, framing manufacturer, SageGlass® IGU manufacturer, electrical contractor, and other parties related to Work of the Section, to review procedured, schedules, safety, and coordination with other elements of Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's instruction for receiving, handling, storing, and protection materials.
B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
C. Store materials in original packaging, protected from exposure to harmful environmental conditions, including static electricity, and at temperature and humidity conditions recommended by manufacturer.

1.6 PROJECT/SITE CONDITIONS

A. Verify location of junction boxes and wall switches near IGUs.
B. Verify location of wire penetration into building.
C. Verify location of control panels within building.

1.7 WARRANTY

A. Warrant SageGlass® Controls against defects in material or workmanship for a period of five years from the date of shipping of the controls from the manufacturer.

PART 2- PRODUCTS

2.1 MANUFACTURERS

NOTE SAGEGLASS® ELECTRICALLY TINTABLE IGUs CAN ONLY BE OPERATED WITH A SAGEGLASS® CONTROL SYSTEM

A. Subject to compliance with requirements, provide prodectus from the following manufacturer:
   1. SAGE Electrochromics, Inc.
      One Sage Way.
      Faribault, MN 55021.
      Telephone: 877-SAGEEC1 (877-724-3321).
      Fax: 1-507-333-0145.
      E-mail: commercialsales@sage-ec.com or technicalservices@sage-ec.com.
      Internet: http://www.sage-ec.com.

2.2 MATERIALS

EDIT NOTE: DELETE THE FOLLOWING CONTROL SYSTEM IF NOT REQUIRED ON PROJECT.

A. SageGlass® Panel Mounted Control System:
   1. Wall Station:
      a. Peak Power: 1 Watt.
      b. Max input voltage: 12 Volts DC.
      c. Max input current: 0.1 Amp.
      d. Fuse rating: 4Amps.
      e. Height: 4.1 inch (10.4 cm).
      f. Width: 1.75 inch (4.45 cm).
      g. Depth: 1.0 inch (2.54 cm).
   2. SageGlass® AT-410 Panel-Mounted Controls (One AT-410 required for every 4 IGUs within the same zone):
      a. Electrical Peak Power: 40 watts.
      b. Maximum Input Voltage: 12 volts DC.
      c. Maximum Input Current: 3.4 amps.
      d. Fuse Rating: 4 amps.
      e. Maximum Output Voltage: 10 volts DC.
      f. Maximum Output Current: 1 amp.
      g. Height: 2.4 inch (6.1 cm).
      h. Width: 4.3 inch (10.9 cm).
      i. Depth: 0.8 inch (2.1 cm).
   3. SageGlass® AT-SIM Panel-Mounted RS-232 serial interface module:
      a. One 9-pin bidirectional serial port.
      b. Two dry contact inputs.
      c. Two LED outputs, 20mA each.
      d. Height: 2.4 inch (6.1 cm).
      e. Width: 4.3 inch (10.9 cm).
      f. Depth: 0.8 inch (2.1 cm).
   4. Power Supply
      a. UL Lsted, Class 2.
      b. Electrical Peak Power: 60 watts.

c. Input voltage: 120 volts DC.
d. Max output voltage: 12 volts DC.
e. Max output current: 5 amps.

5. 120 AC Power Cord.
6. Enclosure: Indoor surface of flush mounted with cover:
   a. Height: 42 inch (106.68 cm).
   b. Width: 14.5 inch (36.83 cm).
   c. Depth: 3.5 inch (8.89 cm)

EDIT NOTE: DELETE THE FOLLOWING CONTROL SYSTEM IF NOT REQUIRED ON PROJECT.

B. SageGlass® AT-410S Control System integrated with wall station:
   1. Peak Power: 40 watt.
   2. Maximum Input Voltage: 12 volts DC.
   3. Maximum Input Current: 3.4 amp.
   4. Fuse Rating: 4 amps.
   5. Maximum Output Voltage: 10 volts DC.
   6. Maximum Output Current: 1 amp.
   7. Height: 4.1 inch (10.4 cm).
   8. Width: 1.75 inch (4.45 cm).
   9. Depth: 1 inch (2.54 cm).
   10. Power Supply:
      a. UL Listed, Class 2.
      b. Electrical Peak Power: 60 watts.
      c. Max Output Voltage: 12 volts DC.
      d. Max Output Current: 5 amps.

THE FOLLOWING MATERIALS ARE NOT FURNISHED BY SAGE ELECTROCHROMICS. THESE NEED TO BE PROVIDED BY CONTRACTOR.

C. Class II Wiring:
   1. Control System to Frame Wire Harness: Multi-conductor type with insulation required by NEC or applicable building codes; gages appropriate to system design.
   2. Control System to Wall Station 4-conductor, dual twisted pair type, 26 AWG minimum conductor size, with insulation required by NEC or applicable building codes.
D. 120V AC Wiring:
   1. 120 AC, 15A service to receptacles in each control enclosure.

2.3 ACCESSORIES

THE FOLLOWING MATERIALS ARE NOT FURNISHED BY SAGE ELECTROCHROMICS. THESE NEED TO BE PROVIDED BY CONTRACTOR.

A. Gang Boxes: Single or double gang type as required to house wall stations.
B. Splice Connectors: Low voltage type, such as wire nuts or terminal strips, for connection IGU frame wire harness and interior low voltage control.
C. Faceplates: Provide standard “Decora” type faceplates to fit installed gang boxes.
D. Junction Boxes: Sized appropriately for necessary Class II connections between the frame wire harness and field wiring.
E. Receptacles: 120V 15A receptacles installed in control enclosures (two receptacles per panel).

PART 3- EXECUTION

3.1 INSTALLATION

A. Ensure that equipment, conduit, gang boxes, and other related materials are installed and ready to receive Work of this Section.
   1. Ensure conduit and boxes are concealed.
B. Install products per SAGE Electrochromics' instructions.
C. Install wall station and control panels in dry locations only.
D. Ensure wire run lengths between control system and IGU pigtail comply with the following distances:

Wire Size	Max. Distance between Window and Control
18 AWG	300 feet
20 AWG	200 feet
22 AWG	120 feet
24 AWG	70 feet

E. Ensure wire run between control panel and wall station is no longer than 2,000 feet.
F. Wall Station: Install in standard single gang wall mounted junction box.
G. Cross function team required.

3.2 COMMISSIONING

A. Before start-up of SageGlass® system, conduct visual inspection to verify system is installed per code and in working order. Verify proper wire connections to and from equipment and insulated glass units.
B. When system is in start-up, conduct an overall system test and verify system is operating per syspem SAGE Electrochromics' operating instructions.

MISC.

Here is some basic information regarding the specification for powering an AT410 output module:

The AT-410 output module will initiate a power on self test after the input voltage exceeds 5 VDC. This test will fail and the controller will shutdown if the applied input voltage does not equal between 9 and 12 VDC. If input voltage over 13.2 VDC is applied to the controller it will be destroyed.

The power supply connected to each AT-410 must provide 12 VDC and 1400 mA for the AT410 to function properly.

VMin = 9 VDC
VNominal = 12 VDC
VMax = 13.2 VDC

IMin = 300 mA (When the controller is idle)
Imax = 1500 mA (When coloring 4 ea. IGUs) – note that this maximum only occurs for 10-30 seconds. If the current supplied is less than this during the early stages of switching, the switching time will be elongated. The amount of the elongation will be dependent on the amount of current supplied, how many panes are connected to each AT410 4-pane output unit and the size of those units. The maximum current is based on switching 4 panes of a reasonable size.

If you are wanting to supply the PV power to the SageGlass® AT410 modules, instead of the standard power supply that plugs into a 110V outlet, then you must ensure that the voltage applied does not exceed the maximum 13.2V. If it does, the controllers will fail and they will not be covered under warranty.

National Semiconductor
The Sight & Sound of Information
analog ZONE Product of the Year
Sign-On | 日本語 | 简体中文 | 繁體中文 | 한국어
Search | Order Parts | Cross-Ref | Home | About Us | Investors | Press Room | Private Sites

LM317 - 3-Terminal Adjustable Regulator

Datasheet | Packaging | Samples & Pricing | Reliability | Design Tools | Application Notes | Knowledge Base

Features

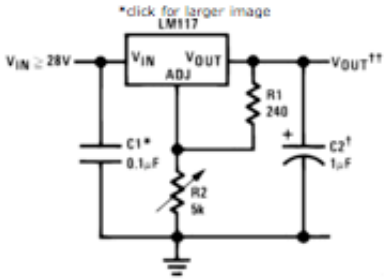
- Guaranteed 1% output voltage tolerance (LM317A)
- Guaranteed max. 0.01%/V line regulation (LM317A)
- Guaranteed max. 0.3% load regulation (LM117)
- Guaranteed 1.5A output current
- Adjustable output down to 1.2V
- Current limit constant with temperature
- P + Product Enhancement tested
- 80 dB ripple rejection
- Output is short-circuit protected

General Description

The LM117 series of adjustable 3-terminal positive voltage regulators is capable of supplying in excess of 1.5A over a 1.2V to 37V output range. More...

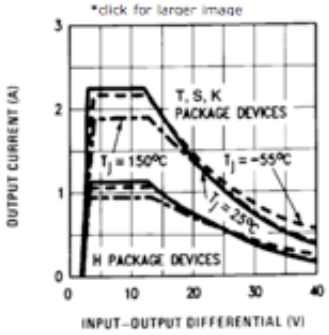
Typical Application

*click for larger image



Typical Performance

*click for larger image



Also Recommended

- LM1086 Lower Dropout Voltage
- LP38690 Lower Quiescent Current, Stable With Ceramic Output Capacitors
- LP38692 Lower Quiescent Current, Stable With Ceramic Output Capacitors & Enable Pin
- LP8340 Lower Dropout Voltage And Supply Current

Additional Resources

Online Seminars

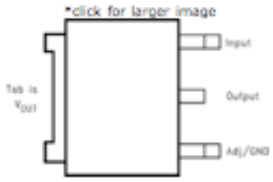
- The Use and Abuse of Amplifiers

Design Tools (see below)

Application Notes (see below)

Connection Diagram

*click for larger image



Datasheet

RoHS Compliance Information	Size in Kbytes	Date			
LM117/LM317A/LM317 3-Terminal Adjustable Regulator	1005 Kbytes	9-Apr-07	View Online	Download	Receive via Email
LM117/LM317A/LM317 3-Terminal Adjustable Regulator (Japanese) 本サイトの日本語版データシートは最新版ではない場合があります。ご検討および ご採用にあたっては、最新の英語版データシートを必ずご確認下さい。	882 Kbytes		オンラインで見る	ダウンロード	Eメールで受けとる

If you have trouble printing or viewing PDF file(s), see Printing Problems.

Package Availability, Models, Samples & Pricing

Marray.com

We carry; Cylindrical Locks, Door Loops, Electric Trim, Exit Devices, Hinges, Mortise Locks, Pivots, Repair Parts, and Tools.

ABOUT US | CONTACT US

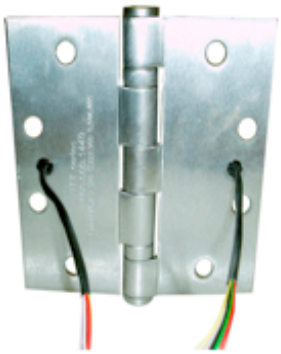
HOME | ORDERING | SHIPPING | SUPPORT | PRODUCTS | Send this page a friend

Categories

Your Basket | Checkout | search | go

- Cylindrical Locks
- Door Loops
- Electric Trim
- Exit Devices
- Hinges
- Mortise Locks
- Pivots
- Repair Parts
- Tools

TEF2+4 Power Transfer Hinge



Quantity in Basket: *none*
Code: **T1**
Price: **$172.00**
Shipping Weight: **2.00** pounds

Quantity: 1 **Add to Basket**

Download pdf specs

Printer Friendly Page

Classifications of finishes

Our 2+4 model power transfer hinge is the first transfer hinge on the market to not only be Listed as a Fire Rated product, but it is also the only hinge Listed for Use with High Amperage Electric Latch Retraction devices. Not only is this product great for standard electrified locking hardware but it can also be used for panic devices where a high load can be expected. Use this model for any application that calls for two, to six conductors. Our wires are also tougher than any of our competitors Each wire is silver coated, high conductivity rarefied copper with Teflon jacketing for abrasion resistence. Don't settle for those 4 small guage wires you will get from other manufactures when you can have two heavy guage wires and four smaller conductors for switching controls, for a better price from Marray, Inc. Our new model, as shown, has the wires coming out in the standard middle location, so little preparation of the frame and door is required. We offer a comprehensive 3 year warranty.

Other products in Hinges:

1. Hinge Door Postition Switch
2. TEF10C Power / Transfer Hinge

END OF SECTION 26 09 00

PART 1 – GENERAL

PART 2 - PRODUCTS

2.1 MPPT CHARGE CONTROLLER MX60

The OutBack MX60 Maximum Power Point Tracking (MPPT) charge controller enables your PV system to achieve its highest possible performance. Rated for up to 60 amps of DC output current, the OutBack MX60 can be used with battery systems from 12 to 60 vdc with PV open circuit voltage as high as 125 vdc. The MX60's setpoints are fully adjustable to allow use with virtually any battery type, chemistry and charging profile. The OutBack MX60 allows you to use a higher output voltage PV array with a lower voltage battery - such as charging a 24 vdc battery with a 48 vdc PV array. This reduces wire size and power loss from the PV array to the battery/inverter location and can maximize the performance of your PV system. The OutBack MX60 comes standard with an easy to use and understand display of the PV system's performance. The four line, 80 character, backlit LCD display is also used for programming and monitoring of the system's operation. The OutBack MX60 can also be connected to the OutBack MATE system controller and display to allow monitoring of up to eight MX60 controllers from a distant location - up to 300 feet away. The MATE also includes an optoisolated RS232 port for connection to a PC computer for data logging and system monitoring.

Output Current Rating: 60 amps DC Maximum at 12, 24 or 48 VDC
Nominal Battery Voltage: 12, 24, 32, 36, 48, 54 or 60 VDC (programmable)
PV Open Circuit Voltage: 125 VDC Maximum
Standby Power Consumption: Less than 1 watt typical
Charging Regulation Methods: Five Stage: Bulk, Absorption, Float, Silent, Equalization
Voltage Regulation Setpoints: 13 - 80 VDC
Equalization Voltage Adjustable: 1.0 to 5.0 VDC above Bulk Setpoint
Temperature Compensation: Programmable slope -2.0mV/oC/Cell to -5.0mV/oC/Cell
Voltage Step-Down Capability: Can charge a 12 or 24 VDC battery from a 48V nominal PV array
Power Conversion Efficiency: 99.1% @ 40 amps Output 97.3% @ 60 amps Output
Digital Display: 4 line 80 character backlit LCD Display
Remote Interface: RJ 45 Modular Connector CAT 5 Cable 8 wire
Operating Temperature Range: -40 to 60oC Power derated above 25oC
Environmental Rating: Indoor Type 1
Conduit Knockouts: Two 3/4 - 1" on the back; One 1" - 1 1/2 " on each side; Two 1" - 1 1/2" on the bottom
Warranty: Two years parts and labor Optional Extended Warranty
Dimensions: Enclosure: 14.5 " H x 5.75" W x 5.75" D Shipping box: 17.75" H x 10" W x 7" D
Shipping Weight: 12 lbs. - 5.4 kg

2.2 SYSTEM MANAGEMENT REMOTE MONITOR AND CONTROL (by MATE)

The OutBack MATE is a complete system controller and display for both the OutBack FX2000 inverter/charger and MX60 MPPT PV charge controller. It provides a display of the operation as well as allows control and adjustment of the setpoints. The OutBack Mate also coordinates the operation of the entire system to maximize performance and to prevent multiple products from conflicting. A single OutBack MATE is able to connect to multiple FX2000 inverter/charges, MX60 MPPT PV charge controllers and any other OutBack power conversion and control products offered in the future. A maximum of ten OutBack products will be able to be connected to a single MATE via CAT 5 / ethernet type cabling with 8 wire RJ45 modular connectors and the OutBack HUB communication manager. The OutBack MATE includes a 4 line backlit LCD display with 80
alphanumeric characters. This allows multiple measurements to be displayed at the same time and reduces the amount of abbreviations required, simplifying the operation and reducing confusion. All of the programmed setpoints are stored in permanent memory to eliminate the need to reprogram the system after a shutdown or battery replacement. The OutBack MATE also includes a built in real time clock and calendar which allows programming of the inverter operation based on the time of day and even day of the week. This can be used to allow the system to work with time-of-day power rates or to limit a generator's run time to a specific time period

of the day or week. The OutBack MATE also includes an opto-isolated RS232 port with a DB9 jack for connection to the serial port of a PC computer. OutBack is working with several third party developers to offer Windows based software programs for datalogging and graphical display of the system's operation and performance. This PC computer software will be available separately and is expected in September, 2002.

2.3 AC POWER SYSTEM

Standard Features and Components

• ETL listed indoor type powdercoated steel enclosure
• Dual snap-in DIN rail type mounting brackets for up to sixteen AC circuit breakers – 15, 20, 25, 30 or 60 amps
• Available with or without a 30 or 60 amp 120 VAC or 120/240 VAC input/output/bypass disconnect breakers with interlock safety switch to allow AC loads to be powered from the utility or generator even if the inverter/charger is removed from the system for servicing or repair – also available as a kit for easy field installation or upgrading
• Ground terminal bus bar
• Isolated neutral terminal bus bar
• Hot terminal bus bar for connecting additional AC load circuits
• Designed to mount directly to the AC end of one or two SW or DR series inverters (Also is easily connected via conduit or raceway to other inverter models)
• Plenty of room for additional current sensors and control relays for advanced system designs

Optional Components

• Additional 30 or 60 amp input/output/bypass disconnects for a second inverter/charger
• Additional AC input or output breakers for back-up generator or AC loads – 15, 20, 30 or 60 amp
• **X-240** - 4 kW step-up/step-down/generator balancing autotransformer
• **X-Fan** - AC cooling fan to increase the autotransformer rating to 6 kW or to ensure efficient operation during high temperature conditions
• **VREA** - Adapter plate for direct connection of a PSAC to a Vanner RE inverter/charger
• **PSA** – Adapter plate for direct connection of a PSAC to a PS series inverter/charger

Physical Dimensions

• PSAC enclosure: 10.5" wide x 9" deep x 32.5" tall (26.6cm x 22.8cm x 82.5cm)
• Shipping size: 12.75" x 36" x 13.75" Weight (without options): 32 pounds (14.5 kG)

2.4 DC POWER SYSTEM

• ETL listed indoor type powdercoated steel enclosure with plenty of conduit knockouts
• Mounting space for up to four large 1.5" wide 175 or 250 amp or six medium 1.0" wide 60 to 100 amp breakers – sizes can be mixed
• Ten spaces for small 0.75" wide 15, 30 or 60 amp breakers and **OBDC-GFP/2** (uses 3 spaces)
• 500 amp 50 mV current shunt standard
• Battery negative/ground bus bar standard
• Battery positive bus bar for DC loads and PV arrays included standard
• Designed to mount directly to the DC end of 1 or 2 Trace DR or SW series inverters without needing additional conduit boxes or fittings
• Easily connected to other inverter models and enclosures via conduit or raceway
• Knockouts on top for two RVPP Solar Boost or three C-series controllers
• Available with or without the circuit breakers and other options pre-installed
• For negative or positive ground systems

Optional Components

• **15, 30, 60, 100, 175 & 250 amp DC rated breakers** for DC inputs/loads and power inverters
• **OBDC-GFP/2** - Dual 60 amp PV ground fault protection system for two PV charge controller. Multiple DC-GFP/2 can be used on the same system – up to four can be installed in a PSDC
• **CCB** - Charge controller bracket for up to three additional C-series controllers on either side

• **TBB** – Insulated terminal bus bar kit for combining or distributing multiple circuits
• **GBB** - Ground bus bar kit for isolating the negative from ground (included with GFP/2 system).
• **VREA** - Adapter plates for direct connection of a PSDC to one Vanner RE inverter/charger
• **PSA** – Adapter plate for direct connection of a PSDC to one PS series inverter/charger
• **MP** - Mounting Plate for assembling a complete power system – 36” wide x 50” wide x 1” thick
- for one PSDC, one PSAC and one or two inverter/chargers – split design to allow UPS shipping

Physical Dimensions
• **PSDC** enclosure: 16” wide x 9” deep x 32.5” tall (40.6cm x 22.8cm x 82.5cm)
• Shipping size: 12.75” x 36” x 19.5” Weight: 38 pounds (17.3 kG) + options

2.5 PV POWER SYSTEM

OutBack Power Systems now offers a PV array combiner which can be used with a wide variety of PV system designs and module configurations. Can be configured with DC breakers for low voltage systems (under 125 VDC) or touch safe type fuse holders for high voltage systems (up to 600 VDC). The **PSPV** is designed to provide NEC code compliant overcurrent protection and interconnection of multiple PV panels or subarrays into one or more PV arrays for connection to charge controllers or inverter systems. The **PSPV** is easily field configured to match your system design and ampacity requirements - It is shipped without the breakers or fuse holders installed – order the quantity, type and amperage needed.

Standard Features and Components
• Outdoor, rainproof powdercoated aluminum enclosure – can be installed on vertical or sloped surfaces or pole mounted
• Snap in DIN rail mounting spaces for up to twelve 125 VDC rated OutBack PV breakers. PV Breakers are hydraulic-magnetic type and are not affected by high ambient temperatures. 10 year warranty on the PV breakers. For 12, 24, 48 and 60 VDC systems with PV array open circuit voltages up to 125 VDC. Load break rated.
• Also available with touch safe type midget fuse holders for high voltage systems up to 600 VDC
• Dual positive breaker combiner busbars – can be installed to provide one or two PV output circuits
• PV negative terminal bus bar with mounting holes for an additional TBB
• #1/0 AWG set-screw compression type box lug terminals for output wiring – accepts bare cable
• Four ¾ and 1 inch conduit knockouts – one on the bottom, back and each side – enough space provided on bottom and back to allow up to a 2 inch conduit punch for larger cabling
• Eight ½ inch knockouts on bottom for PV module or subarray input conduits or strain reliefs
• #1/0 AWG ground lug - can be mounted either on the inside or outside surface
• For negative or positive ground PV systems
• Space allowed for the addition of current sensors and lightning protection components

Optional Components
• **OBPV-6, OBPV-10 OBPV-15 -** UL listed DC breakers - 125 VDC max open circuit with elevator type compression terminals for #2-14 AWG bare wire - 6, 10, 15 amp models available
• **OBPV-FH** -Touch safe type fuse holder 600 VDC fuses – accepts #8-14 AWG wire
• **OBPV-F15** - 15 amp 600 VDC KLKD fuses for the OBPV-FH fuse holder
• **TBB** - Insulated terminal bus bar for adding a second isolated negative circuit (required when using with two RV Power Products Solar Boost MPPT controller)

Physical Dimensions
• **PSPV** enclosure: 9.2” wide x 3.5” deep x 13.1” tall (23.1cm x 8.7cm x 33.2cm)
• Shipping size: 10” x 4” x 14” Shipping Weight: 6 pounds (2.7 kG) + options

2.6 TRANSFORMER

2.7 CONBINER BOXES

DC/DC Converter 48V to 12V VTC1015-ii-oo Specifications

Input Voltages

Nominal (ip)	24	48	72
Actual	** 20 – 35	** 40 – 60	** 65 – 90
Input Amps (max)	72.6	36.3	23
Input Fuse	3 x ATC25	2 x ATC20	1 x ATC30

** Actual startup is at 22, 42, or 67Vdc Input, depending on model

Output Voltages

Nominal (op)	12	24	32	48
Actual	13.6 ± 0.05V	27.2 ± 0.05V	36.3 ± 0.05V	54.4 ± 0.05V
Output Adjustment	± 1.0 Volts			
Output Amps (cont)	0 – 60	0 – 40	0 – 30	0 – 20
Output Amps (max)	70	45	34	22.5
Output Crowbar	16.0 ± 0.5 V	32 ± 1.0 V	43.7 ± 1.3 V	63.9 ± 2.0 V

General

Switching Frequency	60 ± 2 KHz
Idle Power	< 10 Watts
Noise on Input	< 50 milli-Volts
Noise on Output	< 50 milli-Volts
Transient Response	< 2V for 50% Surge (Output Amps/2)
Efficiency	> 85 % @ maximum output
Temp. Range	-25 to 40 deg. C @ maximum output
Isolation	Input-Output & Input-Case 1500 Vdc (500 Vdc @ 24 V In), Output-Case 500 VDC (1500Vdc @ 48 V Out)
Dimensions	14.5 x 10.2 x 5.0 in / 37 x 25 x 13 cm
Clearance	1 Inch (2.5 cm) all around
Material	Marine Grade Aluminum
Finish	Black Powder Epoxy
Fastenings	18-8 Stainless
Weight	10.2 lb / 4.7 kg

designed and manufactured by:

ANALYTIC SYSTEMS WARE (1993) LTD.

#207 12448 82 Ave. Surrey, B.C., V3W 3E9, Canada

phone (604) 543-7378 fax (604) 543-7354

Product Available In:
North America

ERITECH® Convenient Ground Electrode (CGE) Kits

Installing eight-foot-long ground rods can be challenging if purpose-designed driving equipment is not available. Installers stand on ladders, truck beds or use other difficult methods to drive ground rods into the earth. Others cut eight-foot rods into four-foot lengths for installation safety. To alleviate these challenges, ERICO® offers the new ERITECH® Convenient Ground Electrode (CGE) Kit. The kit contains two four-foot, 5/8-in.-diameter, ERITECH copperbonded, steel-pointed and chamfered ground rods; a drive sleeve; an ERITECH compression coupling and an ERITECH® HAMMERLOCK or CP58 grounding connector. The UL®-Listed NEC®-Compliant kit allows for installation from the ground level and is much easier to transport than eight-foot ground rods.

Features

Kit contains two 4-ft (1.2 m) copperbonded ground rods, a coupling, a drive sleeve and a connector

- Easier to install than 8-ft-long (2.4 m) ground rods; allows installation from ground level.
- Easier to transport. It can be shipped via small parcel carrier.
- Available with ERITECH HAMMERLOCK for #4 and #6 solid conductors or with CP58 for #8 solid to #2 stranded conductor
- Contractors only need a length of copper conductor to complete the installation

Applications

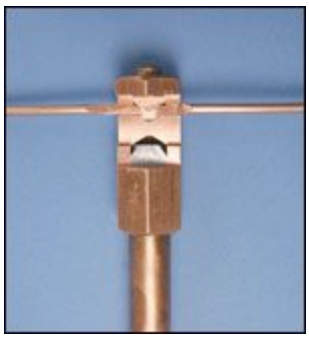
The ERITECH CGE kits are designed for #6 and #4 solid copper conductor applications with ERITECH HAMMERLOCK and #8 solid to #2 stranded conductors with the CP58 connector. Additional wire size applications may be available upon request.

More Information

ERITECH copperbonded steel ground rods resist corrosion and provide for a service life of more than 40 years in most soils. They are manufactured using ERICO's unique copperbonding process which produces a reliable, long-lasting and extremely durable rod. ERITECH rods exceed the requirements of ANSI®/UL 467-2001, CSA® and ANSI/NEMA® GR-1.

The ERITECH HAMMERLOCK taper-fit compression connector included in the kit joins the grounding conductor to the ground rod with the strike of a hammer. No torque wrench is required for proper installation. Machined from electrolytic copper, the connection is highly conductive and designed to withstand ground fault currents and lightning transients. The rugged, irreversible UL-Listed connector exceeds the mechanical strength requirements of IEEE® 837 and maintains the highest level of electrical performance for many years after being buried in the harsh underground environment.

Kits are also available with a CP58 grounding connector. A coupling and drive sleeve complete the CGE kit. A length of conductor is the only thing needed to finish the installation.



END OF SECTION 26 20 00

PART 1 GENERAL

1.1 SECTION INCLUDES

Circuit breaker enclosures shall be furnished and installed at locations as shown on the drawings. Enclosures shall be of the type approved, indicated, and specified herein.

1.2 REFERENCES

Circuit breaker enclosures shall be manufactured in accordance with the following standards:

- UL®489 - Molded Case Circuit Breakers and Circuit Breaker Enclosures
- UL® 50 - Cabinets and Boxes
- NEMA® 250 - Enclosures for Electrical Equipment

1.3 SERVICE ENTRANCE

Circuit breaker enclosures identified for use as service equipment are to be labeled for this application.

1.4 SUBMITTALS

Provide outline drawings with dimensions, voltage, amperage, and integrated equipment short circuit current ratings.

PART 2 PRODUCT

2.1 OPERATING MECHANISM

The circuit breaker operating handle shall be externally operable.

2.2 ENCLOSURE

Enclosure shall be rated for use in indoor applications. The enclosure shall be finished with baked enamel paint. Tangential knockouts shall be provided to facilitate ease of conduit entry.

2.3 ENCLOSURE RATINGS

The integrated equipment short circuit current rating shall be equal to the interrupting rating at the supply voltage marked on the circuit breaker installed, up to 200,000 rms symmetrical amperes short circuit current, or as shown on enclosure wiring diagram.

END OF SECTION 26 28 16

PART 1 – GENERAL
1.1 PRODUCT DESCRIPTION
High efficiency multicrystal photovoltaic module.
Conversion efficiency of the Kyocera solar cell is over 16%
These cells are encapsulated between a tempered glass cover and a pottant with back sheet to provide efficient protection from the severest environmental conditions.
The entire laminate is installed in an anodized aluminum frame to provide structural strength and ease of installation.
Equipped with plug-in connectos.
Manufacturer: KYOCERA Solar, Inc., 7812 East Acoma Drive, Scottsdale, AZ 85260

1.2 SPECIFICATIONS
Typical module production may result in a maximum power from 10% higher to 5% lower than Rated Power (Pmax). Under certain conditions, a photovoltaic module may produce more voltage and current than reported at Standard Test Conditions (STC). Refer to Section 690 of the National Electrical Code for guidance in series string sizing and choosing overcurrent protection.

PART 2 – PRODUCTS
2.1 APPLICAIONS
KC series modules are a reliable, virtually maintenance-free direct current (DC) power source, designed to operate most efficiently in sunlight. KC series modules are ideal for powering remote homes, water pumps, utility grid-tie, telecommunication systems and many other applications either with or without the use of storage batteries.
KC200GT is ideal for grid tie system applications:

- Residential roof top systems
- Large commercial grid tie systems
- Water Pumping systems
- High Voltage stand alone systems

2.2 ELECTRICAL SPECIFICATIONS
Maximum power: 200Watts
Tolerance : + 10 %/-5%
Maximum Power Voltage: 26.3 Volts
Maximum Power Current: 7,61Amps
Open Circuit Voltage: 32.9Volts
Short-Circuit Current: 8.21Amps
Length: 1425mm (56.2in)
Width: 990mm (39.0in)
Depth: 36mm (1.4in)
Weight: 18.5kg (40.7lbs.)

2.3 THERMAL PARAMETERS
Nominal Operating Cell Temperature: 47°C
Isc Current temperature coefficient: $(3.18x10^{3})$A/°C
Voc Voltage temperature coefficient: $(-1.23x10^{4})$V/°C

2.4 WARRANTY
1 year limited warranty on material and workmanship
25 year limited warranty on power output

PART 3 - EXECUTION
3.1 WARNINGS AND SAFETY

Solar modules generate electricity when exposed to light. Arrays of many modules can cause lethal shock and burn hazards. Only authorized and trained personnel should have access to these modules. To reduce the risk of electrical shock or burns, modules may be covered with an opaque material during installation to avoid shocks or burns. Do not touch live terminals with bare hands. Use insulated tools for electrical connections.

PERMIT

Before installing your solar system, contact local authorities to determine the necessary permit, installation and inspection requirements.

INSTALLATION AND OPERATION

Systems should be installed by qualified personnel only. The system involves electricity, and can be dangerous if the personnel are not familiar with the appropriate safety procedures.

Do not step on the module.

Although KC series modules are quite rugged, the glass can be broken (and the module will no longer work properly) if it is dropped or hit by tools or other objects.

Sunlight shall not be concentrated on the module.

The module frame is made of anodized aluminum, and therefore corrosion can occur if the module is subject to a salt-water environment with contact to a rack of another type of metal. (Electrolysis Corrosion) If required, PVC or stainless steel washers can be placed between the solar module frame and support structure to prevent this type of corrosion.

KC series module(s) frame must be attached to a support structure by one of the methods described in Section 6, Installing KC series module(s).

Module support structures that are to be used to support KC series module(s) should be wind rated and approved for use by the appropriate local and civil
codes prior to installation.

FIRE RATING

KC series modules are comprised of a glass front surface, polyvinyl fluoride (PVF) backskin and possess a Class C fire rating.

INSPECTION

Follow the requirements of applicable local and national electrical codes.

BATTERY

When solar modules are used to charge batteries, the battery must be installed in a manner, which will protect the performance of the system and the safety of its users. Follow the battery manufacturer s guidelines concerning installation, operation and maintenance recommendations. In general, the battery (or battery bank) should be away from the main flow of people and animal traffic. Select a battery site that is protected from sunlight, rain, snow, debris, and is well ventilated. Most batteries generate hydrogen gas when charging, which can be explosive. Do not light matches or create sparks near the battery bank. When a battery is installed outdoors, it should be placed in an insulated and ventilated battery case specifically designed for the purpose.

3.2 SITE SELECTION

In most applications, KC series modules should be installed in a location where they will receive maximum sunlight throughout the year. In the Northern Hemisphere, the modules should typically face south, and in the Southern Hemisphere, the modules should typically face north. Modules facing 30 degrees away from true South (or North) will lose approximately 10 to 15 percent of their power output. If the module faces 60 degrees away from true South (or North), the power loss will be 20 to 30 percent. When choosing a site, avoid trees, buildings or obstructions, which could cast shadows on the solar modules especially during the winter months when the arc of the sun is lowest over the horizon.

3.3 MODULE TILT ANGLE

KC series modules produce the most power when they are pointed directly at the sun. For stand alone installations the solar modules should be tilted for optimum winter performance. As a general rule, if the system power production is adequate in the winter, it will be satisfactory during the rest of the year. The solar module tilt angle is measured between the solar modules and the ground. Refer to the recommended module tilt angle table for your site.

For grid tie installations where the solar modules are attached to a permanent structure, the solar modules should be tilted at an angle equal to the site's latitude. This will typically result in the highest annual energy output.

3.4 INSTALLING KC SERIES MODULES

KC series module may be installed in various applications utilizing a variety of support structure options and attachment methods. For optimal performance in all applications, clearance between the module frame and the mounting surface is required to allow cooler ambient air to circulate around the back of the module.

BUILDING ATTACHED: The modules are commonly supported parallel to the surface of the building wall or roof. Clearance between the module frames and surface of the wall or roof is required to prevent wiring damage and to allow air to circulate behind the module. Do not fully enclose the photovoltaic array, as solar modules perform best when cool in temperature. If other mounting means are employed, this may affect the listing for Fire Class Ratings.

FREE STANDING: The supporting structure is used to mount modules at correct tilt angles. The mounting design may have an impact on the fire resistance. KC series module may be attached to a support structure by the following methods:

STANDARD: Utilizing ¼" or 6mm stainless steel hardware through the existing 0.28" diameter (7 mm) mounting holes in the module frame and then through KC series module mounting holes on the support structure. The stainless steel hardware used for securing the module frame should secure with an applied torque of 6 foot-pounds (8 Newton-meters). Refer to the Module Drawings for the position of the solar module mounting holes.

CLAMPING: Top or bottom clamping methods certified by a registered professional engineer, and in compliance with local codes.

OTHER: Other method(s) certified by a registered professional engineer, and in compliance with local codes.

3.5 MODULE WIRING

KC series modules come pre-wired and terminated ready for most building attached or free standing installations. Each module has two #10 AWG type USE-2/RHH/RHW-2 stranded sunlight resistant output cables each terminated with Multi-Contact connectors. The positive (+) terminal has a female connector while the negative (-) terminal has a male connector. The module wiring is solely for series connections only, i.e. female (+) to male (-) interconnections. Series and parallel connections shall be made by use of two #10 AWG type XLP sunlight resistant output cables with male and female Multi-Contact connectors.

NOTE: *When making connections with Multi-Contact connectors, make sure the array is disabled. DO NOT MAKE CONNECTIONS WHILE UNDER LOAD.* Module output connections are marked “Do not disconnect under load”.

NOTE: MAXIMUM SYSTEM VOLTAGE 600 VDC.

KC series modules and most PV system components have a maximum system voltage rating of 600 volts DC. Some grid-tie systems operate at or near this voltage rating. Like other polycrystalline solar modules, the open circuit voltage of the KC series module increases as the ambient temperature decreases. Maximum System voltage is computed as the sum of the open-circuit voltage of the series connected photovoltaic modules for the lowest expected ambient temperature. *Refer to the National Electrical Code Article 690-7(a) for determining the maximum number of KC series modules that can be placed in series.* Temperature coefficients, specific to the module of use, can be used to provide the most accurate prediction of module voltage under temperature extremes.

3.6 GROUNDING

Before installing your solar system, contact local authorities to determine the necessary grounding. Attach all module frames to an earth ground in accordance with the National Electrical Code (NEC). Proper grounding is achieved by connecting the module frame(s) and structural members contiguously one to another using a suitable "grounding conductor". The grounding conductor, or strap, may be copper, copper alloy, or another material acceptable for use as an electrical conductor per NEC. The grounding conductor must then make a connection to earth using a suitable earth ground electrode. Ensure positive electrical contact through the anodizing on the module's frame by utilizing one of the following grounding methods. Attach the grounding conductor

(1) to one of the 0.28" diameter (7 mm) holes marked 'ground' with a bolt or screw assembly that incorporates a bonding or external tooth washer, or a serrated screwhead.
(2) to electrically conductive metal, such as that of a support structure, which has been bonded to the module frame through a bonding or external tooth washer, or a welded, soldered for brazed joint or other suitable means.
(3) with two or more screws, or two full threads of a single screw engaging the module frame metal.

3.7 BLOCKING DIODES
In systems utilizing a battery, blocking diodes are typically placed between the battery and the solar module output to prevent battery discharge at night. KC series modules are made of polycrystalline cells with high electrical .back flow. resistance to nighttime battery discharging. As a result, KC series modules do not contain a blocking diode when shipped from the factory. Most PV charge regulators and inverter incorporate nighttime disconnect feature, however.

3.8 BYPASS DIODES
Partial shading of an individual module in a source circuit string (i.e. two or more modules connected in series) can cause a reverse voltage across the shaded cells within the module. Module output current is then forced through the shaded area by the remaining illuminated cells and other solar modules in series with the partially shaded module(s). The current forced through the shaded cells within the module (or modules) causes additional module heating and severe loss of power. All KC series modules are supplied with factory installed (non user serviceable) bypass diodes.
The purpose of bypass diodes is to provide a low-resistance current path around the shaded cells, thereby minimizing module heating and array current losses.
The solar modules employ bypass diodes that have:
Rated Average Forward Current [IF(AV)] Above maximum system current at highest module operating temperature.
Rated Repetitive Peak Reverse Voltage [VRRM] Above maximum system voltage at lowest module operating temperature.

3.9 MAINTENANCE
KC series modules are designed for long life and require very little maintenance. Under most weather conditions, normal rainfall is sufficient to keep the module glass surface clean. If dirt build-up becomes excessive, clean the glass surface only with a soft cloth using mild detergent and water. USE CAUTION WHEN CLEANING THE BACK SURFACE OF THE MODULE TO AVOID PENETRATING BACK SHEET. Modules that are mounted flat (0 tilt angle) should be cleaned more often, as they will not "self clean" as effectively as modules mounted at a 15 tilt or greater. Once a year, check the general condition of the wiring and check to be sure that mounting hardware is tight. Loose connections will result in a damaged module or array.

END OF SECTION 26 31 00

END OF SECTION 26 31 00

PART 1 - GENERAL

1.2 DEFINITIONS

1. Active Material - In the positive plates, the active material is lead dioxide. In the negative, it's metallic sponge lead. When a circuit is created, these materials react with sulfuric acid during charging and discharging.
2. Ampere (Amp) - A unit of measurement for the electron flow or current through a circuit.
3. Ampere-Hour (Amp. Hr., AH) - A unit of measure for a battery's electrical storage capacity, calculated by multiplying the current in amperes by the time in hours. (Example: A battery which delivers 5 amps for 20 hours provides 5 amps x 20 hours = 100 AH of capacity.)
4. Capacity Rating - The time in minutes that a new, fully-charged battery will deliver 25 amperes or 75 amperes at 80° F and maintain a terminal voltage equal to or greater than 1.75 volts per cell.
5. Cell - The basic current-producing unit in a battery. It consists of a set of positive plates, negative plates, electrolyte, separators and casing. A cell's nominal voltage is 2 volts. (Example: A 12-volt battery has 6 cells.)
6. Circuit - The path followed by a flow of electrons. A closed, or short, circuit is a complete path. An open circuit has a broken path.
7. Cycle - One discharge of a battery plus one recharge.
8. Depth of Discharge (DOD) - The percentage of capacity actually removed from a battery compared to the total rated capacity.
9. Electrolyte - In a deep cycle battery, it is a dilute solution of sulfuric acid and water.
10. Hydrometer - A tool used to measure the specific gravity of the electrolyte solution.
11. Equalization - An overcharge performed on flooded lead-acid batteries after they have been fully charged. This maintenance step helps eliminate stratification and sulfation.
12. Ohm (Ω) - A unit of measurement for electrical resistance within a circuit.
13. Open Circuit Voltage - The voltage of a battery when there is no load attached (not receiving or delivering energy). This measurement is best taken when the battery has been at rest for at least 6 hours.
14. Power Inverter - An electronic device that converts direct current (DC) power from a battery into standard alternating current (AC) house power.
15. Primary Battery - An energy storage device that can deliver energy but cannot be recharged. (i.e., disposable flashlight battery)
16. Secondary Battery - An energy storage device than can deliver energy and can be recharged. (i.e., automotive or deep cycle battery)
17. Separator - A divider made of porous material that is placed between the positive and negative plates in a battery cell and allows current to flow through it, while preventing direct contact between the plates which would cause a short circuit.
18. Specific Gravity (S.G.) - A measurement of the strength of battery electrolyte by comparing its density to that of pure water.
19. Stratification - A condition where the concentration of acid is greater at the bottom of the battery than at the top.
20. Sulfation - The formation of lead sulfate on the positive and negative electrodes.
21. Volt (V) - A unit of measurement for electrical potential within a circuit.
22. Watt (W) - A unit of measurement for electrical power.
23. Watt Hour (Wh) - A unit of measurement for electrical power for a certain period of time.

PART 2 – PRODUCTS

2.1 Model Number 8D-AGM 12V battery, absorbed mat batteries

A. Creates very little hydrogen
B. If batteries are not overcharged, they do not need to be vented
C. Bare minimum of four (4) batteries in house

2.2 MAINTENANCE EQUIPMENT:

Trojan recommends the following equipment for use in battery care and maintenance:

- Wrench
- Post Cleaner

- Distilled Water
- Baking Soda
- Voltmeter
- Petroleum Jelly
- Hydrometer
- Goggles & Gloves

PART 3 – EXECUTION

3.1 INSPECTION

1. Examine the outside appearance of the battery.
   - Look for cracks in the container.
   - The top of the battery, posts and connections should be free of dirt, fluids and corrosion. (If batteries are dirty, see Cleaning section.)
   - Replace any damaged batteries.
2. Any fluids on or around the battery may indicate that electrolyte is spilling, leaching or leaking out.
   - Leaking batteries must be replaced.
3. Check all battery cables and connections.
   - Look closely for loose or damaged parts.
   - Replace any cable that is broken or frayed.
4. Tighten all wiring connections to the proper specification (following page.) Be sure there is good contact with the terminals.

3.2 PROPER TORQUE VALUES FOR CONNECTION HARDWARE

Gel

Button: 90-110 in-lbs
LT: 100-120 in-lbs

3.4 OPEN-CIRCUIT VOLTAGE TESTING

For accurate voltage readings, batteries must idle (no charging, no discharging) for at least 6 hours, and preferably 24 hours.

1. Disconnect all loads from the batteries.
2. Measure the voltage with a DC voltmeter.
3. Check the state of charge with the table below.
4. Charge the battery if it registers 0-70% charged.

If battery registers below table values, these conditions may exist:

1. The battery was left discharged too long.
2. The battery has a bad cell.

Batteries in these conditions should be taken to a specialist for further evaluation, or retired from service.

% STATE OF CHARGE	SPECIFIC GRAVITY CORRECTED TO 80° F	OPEN-CIRCUIT VOLTAGE 6 VOLT	8 VOLT	12 VOLT
100	1.277	6.37	8.49	12.73
90	1.258	6.31	8.41	12.62
80	1.238	6.25	8.33	12.50
70	1.217	6.19	8.25	12.37
60	1.195	6.12	8.16	12.24
50	1.172	6.05	8.07	12.10
40	1.148	5.98	7.97	11.96
30	1.124	5.91	7.88	11.81
20	1.098	5.83	7.77	11.66
10	1.073	5.75	7.67	11.51

State of charge as related to specific gravity and open-circuit voltage

3.6 CLEANING
1. Check that all vent caps are tight.
2. Clean the battery top with a cloth or brush and a solution of baking soda and water.
   - Do not allow any cleaning solution or other foreign matter to get inside the battery.
3. Rinse with water and dry with a clean cloth.
4. Clean battery terminals and the inside of cable clamps with a post and clamp cleaner.
5. Reconnect the clamps to the terminals and thinly coat them with petroleum jelly.
6. Keep the area around batteries clean and dry.

3.7 STORAGE
Important things to avoid:
1. Freezing - Avoid locations where freezing temperatures are expected. Keeping batteries at a high state of charge also prevents freezing. (See table next page.)
2. Heat - Avoid direct exposure to heat sources, such as radiators or space heaters. Temperatures above 80° F accelerate the battery's self-discharge characteristics.
Procedure:
1. Completely charge the battery before storing.
2. Store the battery in a cool, dry location, protected from the elements.
3. During storage, monitor the specific gravity (flooded batteries) or voltage.
   - Stored batteries should be given a boost charge when they show a 70% state of charge or less. (See table previous page.)
4. Completely charge the battery before re-activating.
5. For optimum performance, equalize the batteries (flooded) before putting them back into service. (See Equalizing section.)

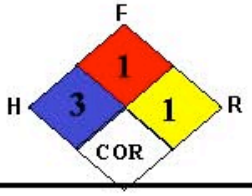
3.8 CHARGING
Correctly charging batteries requires administering the right amount of current at the right voltage. Most charging equipment automatically regulates these values. Some chargers allow the user to set these values. For proper charging, refer to the instructions that came with your charging equipment.
Important things to remember:
1. Become familiar with, and follow the instructions from, the charger manufacturer.
2. Batteries should be charged after each period of use.
3. Lead-acid batteries do not develop a memory and need not be fully discharged before recharging.
4. Charge only in well-ventilated areas. Keep sparks or flames away from a charging battery.
5. Verify charger voltage settings are correct.
6. Check electrolyte level. (See Watering section.)
7. Tighten all vent caps before charging.
8. Do not overcharge or undercharge the batteries.
9 . Never charge a frozen battery.
10. Avoid charging at temperatures above 120° F.

3.10 HOW TO INCREASE SYSTEM POWER
Two or more batteries can be easily connected to boost your system’s voltage and/or capacity. There are three methods to obtain additional voltage and/or capacity, as described below:
To increase voltage, connect batteries in series.
To increase amp-hour capacity, connect batteries in parallel.
To increase both voltage and amp-hour capacity, connect batteries in series/parallel.
NOTE: These systems can also be configured using 12-volt batteries. It is not recommended that you mix batteries of different voltages within the same system.

3.11 CAUTIONS/WARNINGS
Always wear protective clothing, gloves, and goggles when handling batteries and electrolyte.

Do not smoke near batteries. Do not over-tighten terminals. Over-tightening can result in post breakage, post meltdown or fire. The electrolyte is a solution of acid and water, so skin contact should be avoided. Never add acid to a battery. Do not equalize Gel or AGM batteries.

Hazard Rating



TROJAN BATTERY COMPANY
MOIST DRY BATTERY

MATERIAL SAFETY DATA SHEET

SECTION 1 -- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MANUFACTURER'S NAME: TROJAN BATTERY COMPANY	EMERGENCY TELEPHONE NO.: CHEMTREC 800/424-9300
ADDRESS: 12380 CLARK ST., SANTA FE SPRINGS, CA 90670	OTHER INFORMATION CALLS: 562-946-8381 800-423-6569
PERSON RESPONSIBLE FOR PREPARATION: Ismael Pedroza, Jr.	Revised Date: February 15, 2004

SECTION 2 -- COMPOSITION/INFORMATION ON INGREDIENTS

C.A.S.	PRINCIPAL HAZARDOUS COMPONENT(S) (chemical & common name(s)	Hazard Category	% Weight	ACGIH TLV - mg/m³	OSHA PEL/TWA - mg/m³
7439-92-1	Lead/Lead Oxide/Lead Sulfate	Acute-Chronic	60-97%	0.05	0.05
7664-93-9	Sulfuric Acid (Battery Electrolyte)	Reactive-Oxidizer Acute-Chronic	<5%	1	1
7440-38-2	Arsenic (inorganic)	Acute-Chronic	< 0.3%	0.01	0.05
7440-70-2	Calcium	Reactive	<0.15%	Not Established	Not Established
7440-36-0	Antimony	Chronic	<0.15%	0.5	0.5
7440-31-5	Tin	Chronic	< 0.03%	2	Not Established

Note: PEL's for Individual states may differ from OSHA's PEL's. Check with local authorities for the applicable state PEL's.
OSHA – Occupational Safety and Health Administration; ACGIH – American Conference of Governmental Industrial Hygienists; NIOSH – National Institute for Occupational Safety and Health.

COMMON NAME: (Used on label)
(Trade Name & Synonyms) Moist Dry Battery Chemical Family: Toxic and Corrosive Material Mixture

Chemical Name: Lead/Acid Storage Battery Formula: Lead and Acid (electrolyte)

SECTION 3 -- HAZARD IDENTIFICATION

Signs and Symptoms of Exposure	1. Acute Hazards	Do not open battery. Avoid contact with internal components. Internal components include lead and liquid electrolyte. Electrolyte: Electrolyte is corrosive and contact may cause skin irritation and chemical burns. Electrolyte causes severe irritation and burns of eyes, nose and throat. Ingestion can cause severe burns and vomiting. Lead: Direct skin or eye contact may cause local irritation. Inhalation or ingestion of lead dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm and joint pain.
	2. Sub-Chronic and Chronic Health Effects	Electrolyte - Repeated contact with electrolyte causes irritation and skin burns. Repeated exposure to mist may cause erosion of teeth, chronic eye irritation and/or chronic inflammation of the nose, throat and lungs. Prolonged inhalation of a mist of sulfuric acid can cause inflammation of the upper respiratory tract leading to chronic bronchitis. Lead - Prolonged exposure may cause central nervous system damage, gastrointestinal disturbances, anemia, wrist drop and kidney dysfunction. Pregnant women should be protected from excessive exposure to prevent lead from crossing the placental barrier and causing infant neurological disorders. California Proposition 65 Warning: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm, and during charging, strong inorganic acid mists containing sulfuric acid are evolved, a chemical Known to the State of California to cause cancer. Wash hands after handling.
Medical Conditions Generally Aggravated by Exposure	If battery is broken or material is spilled, then persons with the following medical conditions must take precautions: pulmonary edema, bronchitis, emphysema, dental erosion and tracheobronchitis.	

Routes of Entry	Inhalation: Yes Ingestion: Yes	Eye Contact: Yes Skin Contact: Yes				
Chemical(s) Listed as Carcinogen or potential Carcinogen	Proposition 65 - YES	National Toxicology Program - YES	I.A.R.C. Monographs - YES	O.S.H.A. - NO	EPA CAG - YES	N.I.O.S.H. - YES

SECTION 4 -- FIRST AID MEASURES

Emergency and First Aid Procedures	Contact with internal components if battery is opened, broken or spilled.
1. Inhalation	Remove to fresh air and provide medical oxygen/CPR if needed. Obtain medical attention.
2. Eyes	Immediately flush with water for at least 15 minutes, hold eyelids open. Obtain medical attention.
3. Skin	Flush contacted area with large amounts of water for at least 15 minutes. Remove contaminated clothing and obtain medical attention if necessary.
4. Ingestion	Do not induce vomiting. If conscious drink large amounts of water/milk. Obtain medical attention. Never give anything by mouth to an unconscious person.

SECTION 5 -- FIREFIGHTING MEASURES

Flash Point – Not Applicable	Flammable Limits in Air % by Volume: (when charging) Hydrogen (H_2) Lower 4.1% Upper 74.2%	Extinguishing Media – Class ABC, CO_2, HALON.	Auto-Ignition Temperature 675°F (polypropylene)
Special Fire Fighting Procedures	Lead/acid batteries do not burn, or burn with difficulty. Do not use water on fires where molten metal is present. Extinguish fire with agent suitable for surrounding combustible materials. Cool exterior of battery if exposed to fire to prevent rupture. The acid mist and vapors generated by heat or fire are corrosive. Use NIOSH approved self-contained breathing apparatus (SCBA) and full protective equipment operated in positive-pressure mode.		
Unusual Fire and Explosion Hazards	Hydrogen gas and sulfuric acid vapors are generated upon overcharge (when filled with electrolyte) and polypropylene case failure. Ventilate charging areas as per ACGIH Industrial Ventilation A Manual of Recommended Practice and National Fire Code, 1980 Vol. 1, P. 12, B-9, 10. Hydrogen gas may be flammable or explosive when mixed with air, oxygen, chlorine. To avoid risk of fire or explosion, keep sparks or other sources of ignition away from batteries and do not allow metallic materials to simultaneously contact negative and positive terminals of cells and batteries. SULFURIC ACID REACTS VIOLENTLY WITH WATER/ORGANICS.		

SECTION 6 -- ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Stop release, if possible. Avoid contact with any spilled material. Contain spill, isolate hazard area, and deny entry. Limit site access to emergency responders. Neutralize with sodium bicarbonate, soda ash, lime or other neutralizing agent. Place battery in suitable container for disposal. Dispose of contaminated material in accordance with applicable local, state and federal regulations. Sodium bicarbonate, soda ash, sand, lime or other neutralizing agent should be kept on-site for spill remediation.

Personal Precautions: Acid resistant aprons, boots and protective clothing. ANSI approved safety glasses with side shields/face shield recommended. Ventilate enclosed areas.

Environmental Precautions: Lead and its compounds and sulfuric acid are a severe threat to the environment. Contamination of water, soil and air should be prevented.

SECTION 7 -- HANDLING AND STORAGE

Precautions to be Taken in Handling and Storage	Keep away from flames during and immediately after charging. Combustion or overcharging may create or liberate toxic and hazardous gases and liquids including hydrogen, sulfuric acid mist, sulfur dioxide, sulfur trioxide, stibine, arsine and sulfuric acid. Store batteries in cool, dry, well-ventilated areas. Do not short circuit battery terminals, or remove vent caps during storage or recharging. Protect battery from physical damage.
Other Precautions	GOOD PERSONAL HYGIENE AND WORK PRACTICES ARE MANDATORY. Refrain from eating, drinking or smoking in work areas. Thoroughly wash hands, face, neck, and arms before eating, drinking or smoking. Work clothes and equipment should remain in designated lead contaminated areas, and never taken home or laundered with personal clothing. Wash soiled clothing, work clothes and equipment before reuse. Emptied batteries contain hazardous sulfuric acid residue.

SECTION 8 -- EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory Protection (Specify Type)	Acid/gas NIOSH approved respirator is required when the PEL is exceeded or employee experiences respiratory irritation. When exposure levels are unknown or when firefighting, wear a self-contained breathing apparatus with a full facepiece operated in a positive pressure mode.				
Ventilation	Must be provided when charging in an enclosed area. Change air every 15 minutes.	Local Exhaust	When PEL is exceeded.	Mechanical (General)	Normal mechanical ventilation recommended for stationary applications.
Protective Gloves	Wear rubber or plastic acid resistant gloves with elbow length gauntlet when filling batteries.	Eye Protection	ANSI approved safety glasses with side shields/face shield recommended.		
Other Protective Clothing or Equipment	Ventilation, as described in the Industrial Ventilation Manual produced by the American Conference of Governmental Industrial Hygienists, shall be provided in areas where exposures are above the PEL or TLV specified by OSHA or other local, state and federal regulations. Acid-resistant rubber or plastic apron, boots and protective clothing. Safety shower and eyewash.				

SECTION 9 -- PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Electrolyte Approx: 235 °F	Vapor Pressure Electrolyte 1 mm HG @ 145.8°F	Specific Gravity Electrolyte (H_2O = 1) 1.250-1.320 pH < 2	Melting Point: <320°F (polypropylene)
Percent Volatile By Volume Not Applicable	Vapor Density Hydrogen (Air = 1) : 0.069 Electrolyte (Air =1) : 3.4 @ STP		Evaporation Rate Not applicable
Solubility In water Electrolyte: 100% soluble		Reactivity in Water Electrolyte – water reactive (1)	
Appearance and Odor: Battery: Polypropylene or hard rubber case, solid. Lead: Gray, metallic, solid. Electrolyte: Liquid, colorless, oily fluid; nuisance odor when hot or charging battery.			

SECTION 10 -- STABILITY AND REACTIVITY

Stability: Stable	Conditions to Avoid: High temperatures – cases decompose at <320°F Avoid overcharging and smoking, or sparks near battery surface and rapid overcharge.
Incompatibility (Materials to Avoid)	Sparks, open flames, keep battery away from strong oxidizers.
Hazardous Decomposition Products	An explosive hydrogen/oxygen mixture within the battery may occur during charging. Combustion can produce carbon dioxide (CO_2) and carbon monoxide (CO). Molten metals produce fumes and/or vapor that may be toxic or respiratory irritants.
Hazardous Polymerization	Hazardous Polymerization has not been reported. Do not overcharge.

SECTION 11 -- TOXICOLOGICAL INFORMATION

GENERAL: The primary routes of exposure to lead are ingestion or inhalation of dust and fumes.

ACUTE:
INHALATION/INGESTION: Exposure to lead and its compounds may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in the legs, arms and joints. Kidney damage, as well as anemia, can occur from acute exposure.

CHRONIC:
INHALATION/INGESTION: Prolonged exposure to lead and its compounds may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and wrist drop. Symptoms of central nervous system damage include fatigue, headaches, tremors, hypertension, hallucination, convulsions and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity, but there is at present, no substantiation of the implication. Pregnant women should be protected from excessive exposure. Lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure in pregnant women.

SECTION 12 -- ECOLOGICAL INFORMATION

In most surface water and groundwater, lead forms compounds with anions such as hydroxides, carbonates, sulfates, and phosphates, and precipitates out of the water column. Lead may occur as sorbed ions or surface coatings on sediment mineral particles or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in little mobility. Lead may be immobilized by ion exchange with hydrous oxides or clays or by chelation with humic or fulvic acids in the soil. Lead (dissolved phase) is bio-accumulated by plants and animals, both aquatic and terrestrial.

SECTION 13 -- DISPOSAL CONSIDERATIONS

Lead-acid batteries are completely recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. For information on returning batteries to Trojan Battery Company for recycling call 800-423-6569. For neutralized spills, place residue in acid resistant containers with sorbent material, sand or earth and dispose of in accordance with local, state and federal regulations for acid and lead compounds. Contact local and/or state environmental officials regarding disposal information.

SECTION 14 -- TRANSPORT INFORMATION

U.S. DOT PROPER SHIPPING NAME: Batteries, wet, filled with acid
U.S. DOT HAZARD CLASS: 8
U.S. DOT ID NUMBER: UN 2794
U.S. DOT PACKING GROUP: III
U.S. DOT LABEL: Corrosive

IMO PROPER SHIPPING NAME: Batteries, wet, filled with acid
IMO REGULATION PAGE NUMBER: 8120
IMO U.N. CLASS: 8
IMO U.N. NUMBER: UN 2794
IMO PACKING GROUP: III
IMO LABEL: Corrosive
IMO VESSEL STOWAGE: A

IATA PROPER SHIPPING NAME: Batteries, wet filled with acid
IATA U.N. CLASS: 8
IATA U.N. NUMBER: UN 2794
IATA PACKING GROUP: III
IATA LABEL: Corrosive

SECTION 15 -- REGULATORY INFORMATION

U.S. HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD:	LEAD – YES ANTIMONY – YES ARSENIC – YES SULFURIC ACID - YES	
INGREDIENTS LISTED ON TSCA INVENTORY:	YES	
CERCLA SECTION 304 HAZARDOUS SUBSTANCES:	LEAD – YES ANTIMONY – YES ARSENIC – YES SULFURIC ACID – YES	RQ: N/A* RQ: 5000 POUNDS RQ: 1 POUND RQ: 1000 POUNDS

*RQ: REPORTING NOT REQUIRED WHEN DIAMETER OF THE PIECES OF SOLID METAL RELEASED IS EQUAL TO OR EXCEEDS 100 μm (micro-meters).

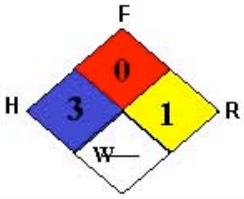
EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE:	SULFURIC ACID – YES
EPCRA SECTION 313 TOXIC RELEASE INVENTORY:	LEAD – CAS NO: 7439-92-1 ANTIMONY – CAS NO: 7440-36-0 ARSENIC – CAS NO: 7440-38-2 SULFURIC ACID – CAS NO: 7664-93-9

SECTION 16 -- OTHER INFORMATION

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, TROJAN BATTERY COMPANY MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES. ALTHOUGH REASONABLE PRECAUTIONS HAVE BEEN TAKEN IN THE PREPARATION OF THE DATA CONTAINED HEREIN, IT IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION. THIS MATERIAL SAFETY DATA SHEET PROVIDES GUIDELINES FOR THE SAFE HANDLING AND USE OF THIS PRODUCT; IT DOES NOT AND CANNOT ADVISE ON ALL POSSIBLE SITUATIONS, THEREFORE, YOUR SPECIFIC USE OF THIS PRODUCT SHOULD BE EVALUATED TO DETERMINE IF ADDITIONAL PRECAUTIONS ARE REQUIRED.

FORM MSDS REV. 2/15/04

Hazard Rating



TROJAN BATTERY COMPANY
VALVE REGULATED LEAD ACID BATTERY

MATERIAL SAFETY DATA SHEET

SECTION 1 -- GENERAL INFORMATION

MANUFACTURER'S NAME: TROJAN BATTERY COMPANY	EMERGENCY TELEPHONE NO.: CHEMTREC 800/424-9300
ADDRESS: 12380 CLARK ST., SANTA FE SPRINGS, CA 90670	OTHER INFORMATION CALLS: 562-946-8381 800-423-6569
PERSON RESPONSIBLE FOR PREPARATION: Ismael Pedroza, Jr.	Revised Date: February 15, 2004

SECTION 2 -- COMPOSITION/INFORMATION ON INGREDIENTS

C.A.S.	PRINCIPAL HAZARDOUS COMPONENT(S) (chemical & common name(s)	Hazard Category	% Weight	ACGIH TLV - mg/m³	OSHA PEL/TWA - mg/m³
7439-92-1	Lead/Lead Oxide (Litharge)/Lead Sulfate	Acute-Chronic	60-90	0.05 mg/m³	0.05 mg/m³
7440-70-2	Calcium (lead calcium alloy)	Reactive	<0.1	Not Established	Not Established
7440-31-5	Tin	Chronic	<0.5	2	Not Established
7440-38-2	Arsenic (inorganic)	Acute-Chronic	<0.1	0.01	0.01
7664-93-9	Sulfuric Acid (Battery Electrolyte)	Reactive-Oxidizer Acute -Chronic	10-30	1.0	1.0
Not applicable	Inert Ingredients	Not applicable	<6	Not Applicable	Not Applicable

Note: PEL's for Individual states may differ from OSHA's PEL's. Check with local authorities for the applicable state PEL's.
OSHA – Occupational Safety and Health Administration; ACGIH – American Conference of Governmental Industrial Hygienists; NIOSH – National Institute for Occupational Safety and Health.

COMMON NAME: (Used on label)
(Trade Name & Synonyms) Battery, Valve Regulated Non-Spillable (VRLA) Chemical Family: Toxic and Corrosive Material Mixture
Chemical Name: Battery, Storage, Lead Acid, Valve Regulated Formula: Lead/Acid

SECTION 3 -- HAZARD IDENTIFICATION

Signs and Symptoms of Exposure	1. Acute Hazards	Do not open battery. Avoid contact with internal components. Internal components include lead and gelatinous electrolyte. Electrolyte - Electrolyte is corrosive and contact may cause skin irritation and chemical burns. Electrolyte causes severe irritation and burns of eyes, nose and throat. Ingestion can cause severe burns and vomiting. Lead - Direct skin or eye contact may cause local irritation. Inhalation or ingestion of lead dust or fumes may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm and joint pain.
	2. Subchronic and Chronic Health Effects	Electrolyte - Repeated contact with electrolyte causes irritation and skin burns. Repeated exposure to mist may cause erosion of teeth, chronic eye irritation and/or chronic inflammation of the nose, throat and lungs. Lead – Prolonged exposure may cause central nervous system damage, gastrointestinal disturbances, anemia, wrist-drop and kidney dysfunction. Pregnant women should be protected from excessive exposure to prevent lead from crossing the placental barrier and causing infant neurological disorders. California Proposition 65 Warning: Battery posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm, and during charging, strong inorganic acid mists containing sulfuric acid are evolved, a chemical Known to the State of California to cause cancer. Wash hands after handling.
Medical Conditions Generally Aggravated by Exposure	Contact with internal components if battery is broken or opened, then persons with the following medical conditions must take precautions: pulmonary edema, bronchitis, emphysema, dental erosion and tracheobronchitis.	
Routes of Entry	Inhalation - YES Ingestion – YES	Eye Contact- YES

Chemical(s) Listed as Carcinogen or potential Carcinogen	Proposition 65 - YES	National Toxicology Program - YES	I.A.R.C. Monographs - YES	O.S.H.A. - NO	E.P.A. CAG - YES	N.I.O.S.H. - YES

SECTION 4 -- FIRST AID MEASURES

Emergency and First Aid Procedures	Contact with internal components if battery is opened/broken.
1. Inhalation	Remove to fresh air and provide medical oxygen/CPR if needed. Obtain medical attention.
2. Eyes	Immediately flush with water for at least 15 minutes, hold eyelids open. Obtain medical attention.
3. Skin	Flush contacted area with large amounts of water for at least 15 minutes. Remove contaminated clothing and obtain medical attention if necessary.
4. Ingestion	Do not induce vomiting. If conscious drink large amounts of water/milk. Obtain medical attention. Never give anything by mouth to an unconscious person.

SECTION 5 -- FIREFIGHTING MEASURES

Flash Point – Not Applicable	Flammable Limits in Air % by Volume: Not Applicable	Extinguishing Media – Class ABC, CO_2, Halon	Auto-Ignition Temperature 675°F (polypropylene)
Special Fire Fighting Procedures	Lead/acid batteries do not burn, or burn with difficulty. Do not use water on fires where molten metal is present. Extinguish fire with agent suitable for surrounding combustible materials. Cool exterior of battery if exposed to fire to prevent rupture. The acid mist and vapors generated by heat or fire are corrosive. Use NIOSH approved self-contained breathing apparatus (SCBA) and full protective equipment operated in positive-pressure mode.		
Unusual Fire and Explosion Hazards	Sulfuric acid vapors are generated upon overcharge and polypropylene case failure. Use adequate ventilation. Avoid open flames/sparks/other sources of ignition near battery.		

SECTION 6 -- ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup. Avoid contact with any spilled material. Contain spill, isolate hazard area, and deny entry. Limit site access to emergency responders. Neutralize with sodium bicarbonate, soda ash, lime or other neutralizing agent. Place battery in suitable container for disposal. Dispose of contaminated material in accordance with applicable local, state and federal regulations. Sodium bicarbonate, soda ash, sand, lime or other neutralizing agent should be kept on-site for spill remediation.

Personal Precautions: Acid resistant aprons, boots and protective clothing. ANSI approved safety glasses with side shields/face shield recommended.

Environmental Precautions: Lead and its compounds and sulfuric acid can pose a severe threat to the environment. Contamination of water, soil and air should be prevented.

SECTION 7 -- HANDLING AND STORAGE

Precautions to be Taken in Handling and Storage	Store away from reactive materials, open flames and sources of ignition as defined in Section 10 – Stability and Reactivity Data. Store batteries in cool, dry, well-ventilated areas. Batteries should be stored under roof for protection against adverse weather conditions. Avoid damage to containers.
Other Precautions	GOOD PERSONAL HYGIENE AND WORK PRACTICES ARE MANDATORY. Refrain from eating, drinking or smoking in work areas. Thoroughly wash hands, face, neck and arms, before eating, drinking and smoking. Work clothes and equipment should remain in designated lead contaminated areas, and never taken home or laundered with personal clothing. Wash soiled clothing, work clothes and equipment before reuse.

SECTION 8 -- EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory Protection (Specify Type)	None required under normal conditions. Acid/gas NIOSH approved respirator is required when the PEL is exceeded or employee experiences respiratory irritation.				
Ventilation	Store and handle in dry ventilated area.	Local Exhaust	When PEL is exceeded.	Mechanical (General)	Not Applicable
Protective Gloves	Wear rubber or plastic acid resistant gloves.	Eye Protection	ANSI approved safety glasses with side shields/face shield recommended		
Other Protective Clothing or Equipment	Safety shower and eyewash.				

SECTION 9 -- PHYSICAL AND CHEMICAL PROPERTIES

Boiling Point: Not Applicable	Vapor Pressure Not Applicable	Specific Gravity 1.250-1.320 pH <2	Melting Point: <320°F (polypropylene)
Percent Volatile By Volume Not Applicable	Vapor Density Hydrogen: 0.069 (Air =1) Electrolyte: 3.4 @ STP (Air = 1)		Evaporation Rate Not applicable
Solubility In water 100% soluble (electrolyte)		Reactivity in Water Electrolyte – Water Reactive (1)	
Appearance and Odor:	Battery: Polypropylene or hard rubber case, solid. Lead: Gray, metallic, solid. Electrolyte: Odorless, white gelatinous semi-solid (absorbed). No apparent odor.		

SECTION 10 -- STABILITY AND REACTIVITY

Stability: Stable	Conditions to Avoid: Avoid overcharging and smoking, or sparks near battery surface. High temperatures-cases decompose at <320°F.
Incompatibility (Materials to Avoid)	Sparks, open flames, keep battery away from strong oxidizers.
Hazardous Decomposition Products	Combustion can produce carbon dioxide and carbon monoxide.
Hazardous Polymerization	Hazardous Polymerization has not been reported.

SECTION 11 -- TOXICOLOGICAL INFORMATION

GENERAL: The primary routes of exposure to lead are ingestion or inhalation of dust and fumes.

ACUTE:
INHALATION/INGESTION: Exposure to lead and its compounds may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in the legs, arms and joints. Kidney damage, as well as anemia, can occur from acute exposure.

CHRONIC:
INHALATION/INGESTION: Prolonged exposure to lead and its compounds may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and wrist drop. Symptoms of central nervous system damage include fatigue, headaches, tremors, hypertension, hallucination, convulsions and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity, but there is at present, no substantiation of the implication. Pregnant women should be protected from excessive exposure. Lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure in pregnant women.

SECTION 12 -- ECOLOGICAL INFORMATION

In most surface water and groundwater, lead forms compounds with anions such as hydroxides, carbonates, sulfates, and phosphates, and precipitates out of the water column. Lead may occur as sorbed ions or surface coatings on sediment mineral particles or may be carried in colloidal particles in surface water. Most lead is strongly retained in soil, resulting in little mobility. Lead may be immobilized by ion exchange with hydrous oxides or clays or by chelation with humic or fulvic acids in the soil. Lead (dissolved phase) is bioaccumulated by plants and animals, both aquatic and terrestrial.

SECTION 13 -- DISPOSAL CONSIDERATIONS

Lead-acid batteries are completely recyclable. Return whole scrap batteries to distributor, manufacturer or lead smelter for recycling. For information on returning batteries to Trojan battery Company for recycling call 800-423-6569. For neutralized spills, place residue in acid-resistant containers with sorbent material, sand or earth and dispose of in accordance with local, state and federal regulations for acid and lead compounds. Contact local and/or state environmental officials regarding disposal information.

SECTION 14 -- TRANSPORT INFORMATION

U.S. DOT PROPER SHIPPING NAME: Batteries, wet, non-spillable
U.S. DOT HAZARD CLASS: 8
U.S. DOT ID NUMBER: UN2800
U.S. DOT PACKING GROUP: III
U.S. DOT LABEL: CORROSIVE

OR **Excepted from the requirements because batteries have passed the Vibration and Pressure Differential performance tests for Nonspillable designation.**

IMO PROPER SHIPPING NAME: Batteries, wet, non-spillable
IMO REGULATION PAGE NUMBER: 8120
IMO U.N. CLASS: 8
IMO U.N. NUMBER: UN 2800
IMO PACKING GROUP: III
IMO LABEL: None required
IMO VESSEL STOWAGE: A

IATA PROPER SHIPPING NAME: Batteries, wet, non-spillable
IATA U.N. CLASS: 8
IATA U.N. NUMBER: UN 2800
IATA PACKING GROUP: III
IATA LABEL: CORROSIVE

SECTION 15 -- REGULATORY INFORMATION

U.S. HAZARDOUS UNDER HAZARD COMMUNICATION STANDARD: LEAD – YES
ANTIMONY – YES
ARSENIC – YES
SULFURIC ACID – YES

INGREDIENTS LISTED ON TSCA INVENTORY: YES

CERCLA SECTION 304 HAZARDOUS SUBSTANCES:

LEAD – YES	RQ: N/A*
ANTIMONY – YES	RQ: 5000 POUNDS
ARSENIC – YES	RQ: 1 POUND
SULFURIC ACID – YES	RQ: 1000 POUNDS

* RQ: REPORTING NOT REQUIRED WHEN DIAMETER OF THE PIECES OF SOLID METAL RELEASED IS EQUAL TO OR EXCEEDS 100 μm (micrometers).

EPCRA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCE: SULFURIC ACID – YES

EPCRA SECTION 313 TOXIC RELEASE INVENTORY:
LEAD – CAS NO: 7439-92-1
ANTIMONY – CAS NO: 7440-36-0
ARSENIC – CAS NO: 7440-38-2
SULFURIC ACID – CAS NO: 7664-93-9

SECTION 16 -- OTHER INFORMATION

THE INFORMATION ABOVE IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, TROJAN BATTERY COMPANY MAKES NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES. ALTHOUGH REASONABLE PRECAUTIONS HAVE BEEN TAKEN IN THE PREPARATION OF THE DATA CONTAINED HEREIN, IT IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION AND INVESTIGATION. THIS MATERIAL SAFETY DATA SHEET PROVIDES GUIDELINES FOR THE SAFE HANDLING AND USE OF THIS PRODUCT; IT DOES NOT AND CANNOT ADVISE ON ALL POSSIBLE SITUATIONS, THEREFORE, YOUR SPECIFIC USE OF THIS PRODUCT SHOULD BE EVALUATED TO DETERMINE IF ADDITIONAL PRECAUTIONS ARE REQUIRED.

FORM MSDS REV. 2/15/04

END OF SECTION 26 33 00

PART 1 – GENERAL
1.1 SUMMARY
A. This section includes information on Data Communications.

PART 2 - PRODUCTS
2.1 PRODUCTS
A. DAQ Equipment
B. Coaxial cables
C. Phone jacks
D. TV jacks

END OF SECTION 27 20 00

Division 31: Earthwork

Section 31 68 00 – Foundation Anchors

PART 1 – GENERAL
SUMMARY
This section includes the specifications for Diamond Piers – Model DP-50

1.1 SCOPE/DESCRIPTION
A. The general conditions, alternates and addenda, applicable drawings and technical specifications shall apply to all work under this section.
B. The contractor shall furnish all materials, labor, equipment and incidentals as shown, specified and required to install Pin Foundations.
C. Work includes preparing site and soil, furnishing, preparing foundation components, aligning, leveling, plumbing and installing foundation components, setting and driving foundation pins, and capping pins.

1.2 RELATED WORK/SECTIONS
A. Superstructure Construction
B. Wood treating/Field Treating
C. Division 05 - Metals

1.3 REFERENCES/STANDARDS
A. ASTM A 53 - Pipe, Steel, Black and Hot dipped, Zinc-coated
B. ASTM A123 - Zinc (hot-galvanized) coatings on Shaped Steel Products
C. ASTM A153 - Zinc coating (hot-dip) on Steel Hardware
D. ASTM , ACI and CRSI standards for precast concrete products
E. ASTM A 820, Type 1- Steel Fiber Re-inforcing.
F. MSDS Pasminco#119 (rev-1) 12/14/1987 - Zinc Material Safety Data Sheets

1.4 DELIVERY/STORAGE AND HANDLING
A. Contractor shall verify upon delivery that all the proper materials have been received.
B. Contractor shall protect the materials from damage. See Temporary Product Storage of Galvanized Components in Manufacturer's Installation Instructions.
C. Contractor shall review MSDS documents and, when required. maintain a copy on site at all times.

1.5 SUBMITTALS
A. Latest edition of Manufacturer's Installation Instructions.
B. Manufacturer's evaluation of foundation system load capacities for this project.

1.6 QUALITY ASSURANCE/TESTING
A. Soil testing and outside inspection or vendor supervision will be paid for by the owner.

PART 2 PRODUCTS
2.1 MANUFACTURER
A. Pin Foundations, Inc. 8607 58th Ave. NW, Gig Harbor, WA 98332 (253) 858-8809

2.2 SYSTEM TYPE
A. Diamond Pier – DP-50 – Precast heads to be minimum 3500 psi concrete, six sack mix, 3/8" aggregate, with 6% total air entrainment. Reinforcing to be 11/2" corrugated steel fiber strand reinforcing- ASTM A820, Type 1. Cast in place pin cavities – sleeveless. Maximum Load – 4000#.

2.3 PINS/CAPACITY
A. Four pins per pier. Capacity relative to length, diameter, and driving angle in site specific soils. All Pins

to be galvanized steel, pipe or tube with butt cut driving ends. DP-100s to use Schedule 40, or schedule 80, 1 ½" nominal pipe or 1.9 OD guage 10, 60 K tube. DP-50 to use schedule 40, 1" nominal pipe, or 1.315 OD guage 12, 60 K tube. Pins to be capped with UV resistant vinyl caps, sealed with 50 year adhesive caulk.

2.4 CONNECTIONS/POSTS/BEAMS

A. Diamond Pier connection to be galvanized steel post base attached to pier with single galvanized anchor bolr. Anchor bolt for DP-100s to be 5/8" hot dip galvanized, grade 2 carriage bolt. For DP-50, anchor bolt to be ½" hot dip galvanized, grade 2 carriage bolt.
B. Pressure treated posts to have treated ends at bracket interface when feasible.

PART 3 EXECUTION

3.1 INSPECTION/TESTING

A. Contractor shall verify superstructure layout, spans and resulting loads for consistency with the manufacturer's evaluated capacities, and report any inconsistencies to the owner's agent prior to installation.

3.2 SITE PREP

A. Alteration of site soils or vegetation is to be kept to a minimum to avoid erosion and the need for re-vegetation.

3.4 EQUIPMENT/INSTALLATION

A. Foundation system to be installed with hand-carried/hand-held tools only.
B. Pins to be full length as specified before driving. No coupled or welded pins are to be used.
C. Follow Manufacture's Installation Instructions for Bracket attachment or Pier Placement and Pin Driving
D. Pins may be cut off in a partially driven position if it they meet substantial resistance in the soil. Refer to specific Manufacturer's Installation Instruction procedures for establishing proper conditions before cutting any pins.

MANUFACTURER'S INSTALLATION INSTRUCTIONS (Diamond Pier TM - Model DP-50)

You will need: Diamond Piers with the corresponding number of Pins and Pin Caps, a shovel, automatic driving hammer with driving head, a sledge hammer, a level, and a reciprocating or cut off saw with a steel cutting blade. (Note: *Most applications will not require the use of a cut off saw.*) Note: Check for buried utilities before Pin Driving.

Step 1: Dig a hole with a conical base which is approximately the shape of the base of the concrete pier and slightly larger than the width of the pier itself to allow for adjustment. *(On sloping terrain, dig the hole deeper on the uphill side so that the concrete pier sits level.)*

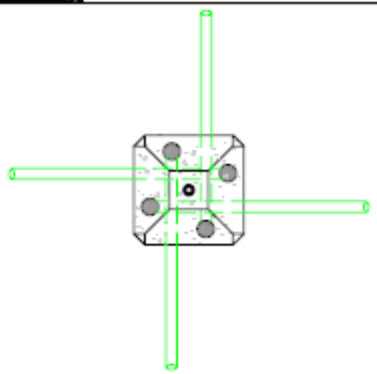
Step 2: Position the concrete pier in the hole, and plumb - brace as necessary. (*The hole may be backfilled with soil as a substitute for bracing, provided that no further adjustments for plumb or centering will be required.) See Note 1.*

Step 3: Slide opposing Pins through the driving cavities in the concrete pier, and, making sure to support them in the center of the cavity, set the Pins a foot or two into the soil with the sledge hammer or sliding post driver. Then drive each Pin alternately in increments with the automatic hammer, periodically checking for plumb and centering. *(Avoid hitting the Pier with the automatic hammer.)* Do not attempt to drive the pins all the way down just with the sledge hammer, or allow the weight of the auto-hammer to force the pin against the lower half of the cavity. The piers are concrete and may crack if subjected to continued impact blows with the Pin in this orientation. A cracked pier must be removed and replaced.

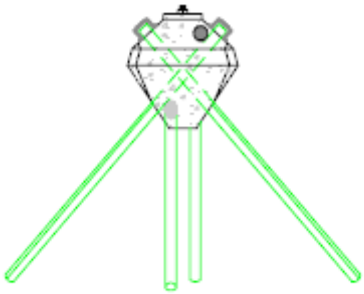
Step 4: Finish driving the Pin with the automatic hammer or sledge, leaving 3/4" protruding from the top of the cavity, and being careful not to damage the precast pier, or upper ends of the pin. Allow for inspection of the pin length down through the core of the Pin, and once dead loads have been applied, verify the length of the protruding pin, adjust as necessary by tapping with the sledge, and cover the exposed end of the Pin with the cap, sealing it against the concrete with a 50 year, siliconized adhesive caulk, or equal. (Note: *Ensure that the concrete is dry before applying caulk.)* Repeat steps 1 through 4 for the remaining Concrete Piers.

Note 1: Do not drive a Pin all the way down at once if this causes the Pier to be pulled to one side. Continue to rotate around the Pier, driving the Pins in increments, until the growing strength in the pile group is sufficient to allow final driving. If loss of plumb is not a problem, the Pins may be driven all the way one at a time.
Do not continue to hammer away at a Pin which is bouncing or rattling against an impassable object if it causes the Pier to ride up the pile along the sleeve. Ensure that the pier will remain in place when encountering difficulties in the soil, and when following the steps in Note 2.

Note 2: If a Pin meets substantial resistance in the soil before it has been driven its full length, full tip end bearing has been achieved and it may be left in this partially driven position and cut off, provided: 1) the pin will not drive more than an inch during a full 60 seconds of uninterrupted automatic hammering, 2) attempts to drive the pin with single sudden 10 lb. sledge hammer blows have been made, and 3) if after a reasonable period, attempts to redrive the Pin using both methods 1) & 2) have been made. Pin ends may be sharpened to improve driving in difficult material. Provide a double miter cut or other symetrical point. (Assymetrical points will cause the pin to "skate" off line.)
If an obstruction is close enough to the surface or within the soil frost zone, it may be dug up and removed. Once accomplished, recompact the soils and reset the pier and redrive the Pin. The pier may also be turned, or relocated, within the parameters of your superstructure design, in order to avoid underground obstacles. Pins may be removed by turning them with a monkey wrench and corkscrewing them upward.

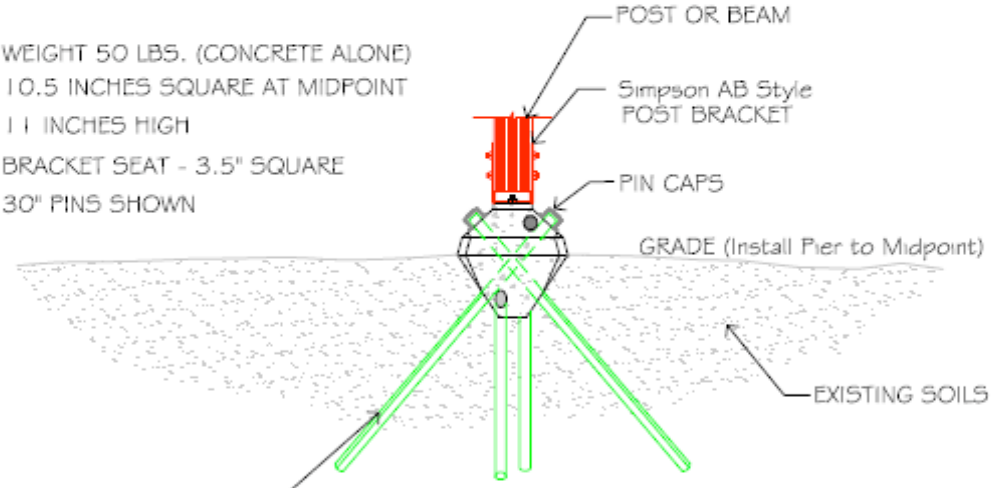


PLAN VIEW W/ 30" PINS



ELEVATION W/ 30" PINS

WEIGHT 50 LBS. (CONCRETE ALONE)
10.5 INCHES SQUARE AT MIDPOINT
11 INCHES HIGH
BRACKET SEAT - 3.5" SQUARE
30" PINS SHOWN



1" NOM. DIAMETER GALVANIZED PIPE
LENGTH VARIES WITH SOIL CONDITIONS
SEE MANUFACTURER'S CAPACITY GUIDELINES

DIAMOND PIER™ DP-50

US PAT. #5039256 & #6578333

COPYRIGHT: ©2005
ALL DETAILS IN WHOLE, OR IN PART, OR ANY PORTION THEREOF ARE COPYRIGHTED BY PIN FOUNDATIONS, INC. AND MAY BE USED BY THE RECIPIENT OR THEIR ASSIGNS FOR PROJECT APPLICATIONS ONLY.

PIN FOUNDATIONS, INC.
8607 58th AVE. NW
GIG HARBOR, WASHINGTON 98332
(253) 858-8809

Division 32: Exterior Improvements

Section 32 93 00 - Plants

SECTION 31 93 00 PLANTS 31 93 00-1

PART 1 – GENERAL

1.1 ENVIRONMENTAL CONSIDERATIONS

A. Select certified wood products (conserves resources, protects habitats)
B. Use treated lumber products that do not contain arsenic or chromium (reduces pollution, protects habitats)
C. Specify stainless steel or hot-dip galvanized fasteners with ACQ or copper azole wood treatment.
D. Select recycled-content materials (conserves resources, diverts materials from landfill).
E. Minimize water consumption: Use native plants that require no irrigation, or use hand or drip irrigation (conserves water).
F. Select durable materials (conserves resources).
G. Use compost (recycles kitchen and garden waste, avoids petroleum-based fertilizers).
H. Use native plants appropriate to native soil and climate zone (reestablishes native ecosystems, conserves water, minimizes soil conditioning, improves biodiversity).
I. Eliminate or minimize pesticide and herbicide use (protects habitats and biodiversity).

1.2 SUBMITTALS

A. Product Data: Submit product data on wood preservative materials and include application instructions.
B. wood comes from an independently certified, well-managed forestry source.

1.3 DEFINITIONS

A. Native Plants: Plants that are naturally found within the Michigan or DC bioregion and were not introduced by humans (generally less dependent on irrigation and soil amendments)
B. Drip Line: Line on the ground around the base of a tree equivalent to the extent of the tree's canopy.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fertilizer: Organic. Do not use fertilizers containing petrochemical additives or that have been treated with pesticides or herbicides.
B. Wood:
    1. Untreated, naturally rot-resistant, heart wood [cedar, elm, black locust]
    2. FSC-certified wood products
    3. Wood, Pressure-Treated. (Do not use CCA lumber) ACQ: Ammoniacal copper quarternary compound.
C. Plastic lumber: 100% recycled content
D. Composite plastic lumber: Fiberglass-reinforced recycled HDPE plastic
E. Metal:
    1. Cast Iron: 100% post-consumer, recycled content
    2. Aluminum: Minimum 50% post-consumer recycled content
F. Mulch: Do not use mulch that has been treated with pesticides.
    1. Cellulose containing 60--100% post-consumer newspaper or wood waste
    2. Shredded organic material from Michigan or DC site
G. Soil Amendments:
    1. Organic compost
    2. Untreated ground gypsum-board scrap without fiberglass or other haz. matls.
H. Plant Materials:
    1. Species native to the region and site conditions.
    2. Nonnative species: Noninvasive species requiring no irrigation after they are established
I. Tree Stakes:

1. Plastic 100% recycled post-consumer plastic
2. Wood: Salvaged lumber (see Section 06100, 1.02)

J. Ties: Recycled polypropylene

K. Water: Free from harmful amounts of acids, alkalis, salts, chemical pollutants, and organic matter
1. Stormwater collected from roofs
2. “Graywater”: Filtered and stored to avoid odor from anaerobic bacteria

2.2 PRODUCTS

A. Tree Guards: 100% post-consumer plastic Benches, Tables, Chairs, Waste Receptacle, Miscellaneous Site Furnishings:
1. Wood: (see 2.01, above)
2. Metals with high recycled content or from salvaged source
3. 100% post-consumer plastic or composite plastic

B. Planters and Deck Railings/Guards: Wood from salvaged, or FSC-certified, well-managed forest products.

C. Plastic pipe:
1. ABS: Minimum 50% post-consumer recycled plastic content
2. HDPE: Minimum 50% post-consumer recycled plastic content

D. Irrigation Systems - Soaker hose: Minimum 65% post-consumer recycled rubber content

E. Grasses and Chaise Planters:
1. Purple lovegrass
2. Gray goldenrod
3. Flowering spurge
4. Butterfly weed
5. Smooth Aster
6. Cinnamon fern
7. Harebell

F. Garden Planter:
1. Various melons, celery, tomato, carrots, cucumbers, squash, zucchini, lettuce, cabbage

G. Courtyard planter:
1. Winged sumac
2. Witch Hazel

PART 3 - EXECUTION

3.1 SITE LAYOUT

A. All elements installed on the National Mall are to minimize contact with the grass, so all plant materials will be in planters on legs with hold-downs.

3.2 WASTE MANAGMENT

B. Separate and recycle waste material in accordance with the Waste Management Plan and to the maximum extent economically feasible.

END OF SECTION 31 93 00

SECTION 33 82 33 COAXIAL COMMUNICATIONS DISTRIBUTION CABLING 33 82 33-1

PART 1 – GENERAL
1.1 SUMMARY
A. This section includes information on Coaxial Communications Distribution Cabling.

PART 2 - PRODUCTS
2.1 PRODUCTS
A. TV jacks

END OF SECTION 33 82 33

PART 1 – GENERAL
1.1 SUMARY
This section includes information on trailers and haulers

PART 2 - PRODUCTS
2.1 PRODUCTS

A. Transport Car Carrier: 12000 GVW Hualmark Thrifty Hauler
    a. Battery and Tank Trailer
    b. 18 foot, 48 inch side door, ramp door, LED lights, stoneguard, 4-D-Rings, 2-dome lights/wall switch
    c. Manufacturer: USA Trailers
B. Cranes
C. House trailer
    a. Low carriage for larger modules
    b. Truck for everything else

END OF SECTION 34 77 00

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Comply with local jurisdictions regarding requirements for using recycled water for irrigation or other purposes.
B. Waste treatment ponds and constructed wetlands shall be designed by an engineer with experience in such systems and in accordance with all local and state codes and water quality standards.

1.2 ENVIRONMENTAL CONSIDERATIONS

A. Qualities:
B. Wastewater is rich in nutrients.
C. Treated wastewater is suitable for agricultural purposes.
D. Problems:
    1. Traditional waste treatment is energy- and chemical-intensive.
    2. Traditional waste conveyance and treatment wastes potable water.
    3. Traditional waste treatment creates sludge, a solid waste problem.
    4. Traditional septic tank - leach field systems can result in excessive nutrients reaching surface and ground waters, disrupting ecosystems.
    5. Many urban areas still have combined wastewater and stormwater systems, which cause untreated wastewater to pollute surface waters during periodic overflow events.
E. Recommendations:
    1. Use biological wastewater treatment systems that minimize the need for chemical treatment.
    2. Use treated wastewater for irrigation and groundwater recharge.
    3. Use composting toilets and waterless urinals to minimize wastewater generated.
    4. Separate graywater for irrigation or other uses if permitted by local codes.
    5. Use planted buffer strips at driveways and parking areas to pretreat runoff, reduce pollution, and protect natural habitats.

1.3 DEFINITIONS

A. Advanced Integrated Wastewater Pond System (AIWPS): Pond with chambered bottom serving as an anaerobic primary digester, high-rate algae ponds serving as the secondary digester, and algae harvesting tanks.
B. Upflow Activated Sludge Blanket Reactor (UASBR): Modified septic tank system introduces waste into the first chamber of the reactor near the bottom, allowing mixing and more complete digestion of solids, and reducing solids by up to 50%.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Clay Liners:
B. Local clays: Conform to engineering specifications for permeability.

2.2 PRODUCTS

A. Upflow Activated Sludge Blanket Reactor (UASBR): Septic tank configured with upflow inlet to promote mixing of solids and baffling to enhance settling
B. Sewer Pipe:
C. Plastic pipe:
D. HDPE: Minimum 50% post-consumer recycled plastic content
E. Filter Fabric: 100% post-consumer recycled-plastic-content geotextile
F. Filter Material: Recycled, crushed concrete, graded 3/4" minimum to 1-1/2" maximum, free-draining

G. Gasketed Pipe Joining System: Plastic, minimum 50% post-consumer recycled plastic content
H. Prefabricated Weirs: For controlling water levels in treatment ponds and wetlands
I. Pond Liners:
J. Clay matt: Bentonite clay sandwiched between geotextile fabric
K. Plastic liners for small garden ponds: 100% post-consumer HDPE shell
L. Ultraviolet Light Disinfection System

PART 3 - EXECUTION

3.1 INSTALLATION

A. Plan equipment and vehicle access to minimize and confine soil disturbance and compaction to areas indicated on Drawings.
B. Do not disturb topsoil and vegetation in areas outside those indicated on the Drawings.
C. Protect trees, vegetation, and other designated features by erecting a high-visibility, reusable construction fence. Limit access of people, equipment, and supplies inside fencing. Locate fencing no closer to trees than the drip line. Any trenching or other root-cutting activity affecting any tree designated on the site plan for protection must be no closer than 20 trunk-diameters from the tree, unless indicated otherwise on the plan. Use tunneling equipment if it is necessary to run utilities closer to such trees.
D. Provide on-site locations for storing as much excavated rock, soil, and vegetation as possible.
E. Provide erosion control measures and hydro-seeding to protect slopes.
F. Create swales across slopes to intercept surface water, recharge groundwater, and prevent erosion; plant with native vegetation.

END OF SECTION 44 40 00