Product Data Sheet

FOAMULAR® Extruded Polystyrene Insulation

For Poultry Houses and Other Agricultural Construction Applications

Cost-efficient insulation for use in animal confinement, crop containment and machinery storage facilities.

A well-insulated poultry house that provides a constant, controlled environment can add significantly to profitability. FOAMULAR extruded polystyrene rigid foam insulation offers distinct benefits that meet this profit aim by creating an atmosphere that can help reduce animal stress and mortality. Result: maximum productivity. In short, FOAMULAR insulation is perfect for agricultural applications because of these important characteristics:

- Superior R-value* and long-term insulating performance
- Excellent moisture resistance
- Tight-fitting edges that prevent energy leakage
- Special extended-length sizes for ease of construction
- Lightweight for ease of handling
- Tough compressive strength for damage resistance
- Total washability for easy maintenance
- Resistant to decay, mildew and fungus growth

FOAMULAR insulation increases efficiency in both installation and maintenance procedures, which can result in significant savings.

Insulating for All Seasons

FOAMULAR insulation provides stable thermal properties that are of great value throughout the year. In warm months, when good ventilation is needed to provide fresh air and control excess heat, humidity and odor, the material's insulating effectiveness helps reduce heat gain from solar loading, thereby increasing poultry house yield. In the winter, FOAMULAR insulation reduces heating requirements and helps keep a stable poultry house temperature.

FOAMULAR insulation is economical, easy to install and assists in saving energy and increasing productivity. The material is impervious to moisture and is rugged enough to resist damage from high-pressure washdowns while it maintains superior insulating properties for the life of the building.

Product Availability

Thickness	1" 1½"	1" 1½"
Width x Length	48" x 200"- 318"	24" x 96" 48" x 96"
Edges	Ship-lap	Square or T&G

Which FOAMULAR Insulation Product Is Right for You?

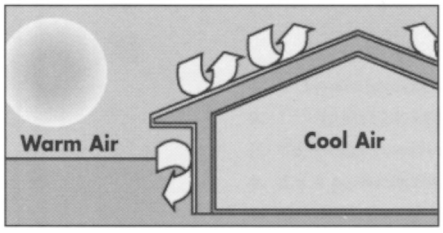
Although FOAMULAR insulation is available in a wide variety of configurations, two specific FOAMULAR products are most frequently used in agricultural applications:

- **AGTEK** insulation offers special long-length sizes to meet the distinct needs of poultry house roof and ceiling applications. AGTEK has ship-lap edges that fit snugly together for a tight seal.
- **FOAMULAR 250** insulation is a multi-purpose insulation that can be used in many different locations, including gable ends. FOAMULAR 250 insulation is available with either square or tongue-and-groove edges.

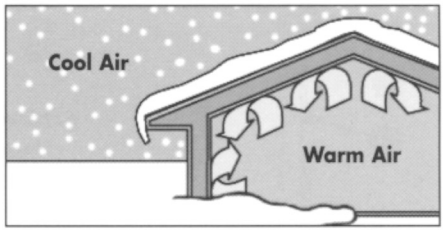
Both products are available in either 1" (R-5) or 1½" (R-7.5) thicknesses, and both can be "sandwiched" together to create higher R-values.

FOAMULAR insulation can be applied to girts in sidewall construction or purlins in roof construction, on the interior of either wood or steel-framed buildings. In addition to providing valuable insulating power, the warm surface of the material helps to reduce corrosion-causing condensation in these applications, which translates into longer building life.

FOAMULAR insulation also works well in a drop ceiling configuration. Installed on the underside of the bottom cord of roof trusses, it is more durable than plastic films and is capable of protecting and supporting the weight of blown insulation or glass fiber insulation batts or blankets used for additional insulation.



Summer – FOAMULAR insulation decreases heat gain inside the building.



Winter – FOAMULAR insulation helps prevent heat loss.

*The higher the R-value, the greater the insulating power. Ask your seller for the fact sheet on R-values.

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Physical Properties

Property	ASTM Method[2]	Product/Values FOAMULAR AGTEK® Insulation	FOAMULAR 250 Insulation
Thermal conductivity – "k" (Btu x in/ft² x hr x °F max.)[3]			
@ 75 °F mean temperature	C 518	0.20	0.20
@ 4 °F mean temperature		0.18	0.18
Compressive strength **minimum** (specification) value (lb/in²)[4]	D 1621	25.0	25.0
Flexural strength (lb/in² min.)[5]	C 203	75	75
Water absorption (% by volume max.)[6]	C 272	0.10	0.10
Water vapor permeance (perm max.)[7]	E 96	0.60	0.60
Water affinity	–	hydrophobic	
Water capillarity	–	none	none
Dimensional stability (% linear change, max.)[8]	D 2126	2.0	2.0
Linear coefficient of thermal expansion (in/in/°F max.)	–	2.7×10^{-5}	2.7×10^{-5}
Flame spread[9][10]	E 84	5	5
Smoke developed[9][10][11]	E 84	45-175	45-175
Oxygen index min.[9]	D 2863	24	24

(1) Properties shown are representative values for 1" thick material based upon most recent product quality audit data. (2) Modified as required to meet ASTM C 578-92. (3) Thermal resistance (R) – (hr x ft² x °F/Btu) – of a 1" thickness 5.0 (at 75 °F mean temperature), 5.4 (at 40 °F mean temperature). (4) Value at yield. (5) Value at yield or 5%, whichever occurs first. (6) Data ranges from 0.00 to value shown, due to the level of precision of the test method. (7) Actual water vapor permeance data decreases as thickness increases. (8) Data ranges from 0.0 to value shown. (9) These laboratory tests are not intended to describe the hazard presented by this material under actual fire conditions. (10) Data from Underwriters Laboratories, Inc.® Classified. See Classification Certificate U-197. (11) ASTM E 84 is thickness-dependent, therefore a range of values is given.

How Much FOAMULAR Insulation to Use

The American Society of Agricultural Engineers (ASAE) has created Standard 401.1 "Use of Thermal Insulation in Agricultural Buildings" to provide a guide for construction practices. The chart below shows their recommendations for various climactic zones in the U.S.

To determine the thickness of FOAMULAR insulation to use in your area, see what the ASAE recommends in terms of U-value. Then consult the Design U-values, Winter Conditions table next page for the thickness you need to meet the recommendation.

When you combine warm weather heat-gain prevention with cold weather heat-loss prevention, you come up with a powerful argument for insulating with FOAMULAR insulation. What it may mean to you is this simple formula:

More FOAMULAR Insulation =

Greater Feed Conversion =

More Pounds per Bird

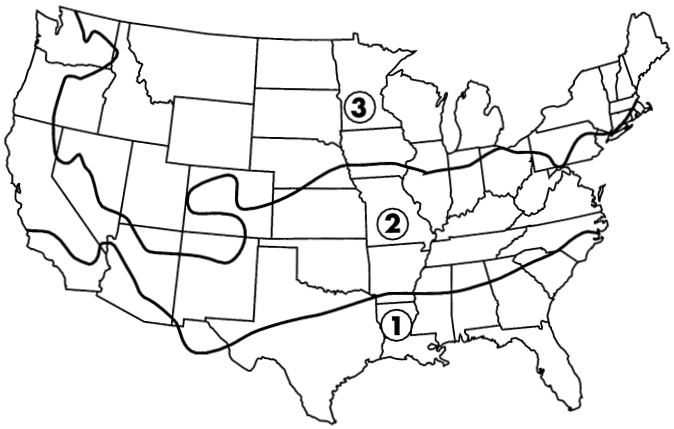
Fire Performance

FOAMULAR extruded polystyrene insulation has passed UL 1715[1], and has a flame spread of 5 and smoke developed less than 450[2][3]. These flammability properties meet the recommendations in ANSI/ASAE S401.2 for exposed insulation in agricultural buildings. Most building codes contain exemptions for agricultural buildings. Always check with your local building code department and with your insurance carrier for acceptability of planned construction details.

Refer to ANSI/ASAE S401.2 for additional information on insulation flammability in agricultural buildings.

(1) Contact Owens Corning for test details.
(2) See UL classification certificate U-197
(3) These laboratory tests are not intended to describe the hazard presented by this material under actual fire conditions.

Figure 1



Insulation Values

5.3.1 Cold buildings have indoor conditions about the same as outside conditions. Examples are machinery storages, cold free stall barns and open front livestock buildings. Minimum insulation is frequently recommended in the roof of these buildings to reduce solar heat gain in summer and to reduce condensation in winter.

5.3.2 Modified environment buildings rely on insulation, natural ventilation, and animal heat to remove moisture and to maintain the inside within a specified temperature range. Examples are warm free stall barns, poultry production buildings and swine finishing units.

5.3.3 Supplementally heated buildings require insulation, ventilation and extra heat to maintain the desired inside temperature and humidity. Examples are farrowing buildings, plant product storages, farm shops and offices. Cold and modified environment buildings requiring.

Minimum Recommended Overall Coefficients of Heat Transmission, U, for Insulated Assemblies[1] (ref. MWPS)

Climactic Zone[4]	Recommended Minimum U-values[3]					
	Cold		Modified		Supplementary	
	Walls	Ceiling	Walls	Ceiling	Walls	Ceiling
			W/(m²•K)			
1	–	0.91[5]	0.91[5]	0.40	0.40	0.26
2	–	0.91	0.91	0.33	0.40	0.23
3	–	0.91	0.48	0.23	0.29	0.17
			Btu/(h•ft²•°F)			
1	–	0.17[5]	0.17[5]	0.071	0.071	0.045
2	–	0.17	0.17	0.059	0.071	0.040
3	–	0.17	0.083	0.040	0.050	0.030

(1) Use assembly U-values which include framing effects, air spaces, airfilms, linings and sidings. Determine assembly U-values by testing the full assembly in accordance with ASTM C 236 or C 976 or calculate by the procedures presented in the ASHRAE Handbook of Fundamentals.

(2) The values shown do not represent the values necessary to provide a heat balance between heat produced by products or animals and the heat transferred through the building.

(3) For poultry grow-out buildings, a U-value of 0.63-0.81 W/(m²•K)[0.11-0.14 Btu/(h•ft²•°F)] in the roof and walls is current practice.

(4) Refer to figure 1.

(5) Where ambient temperature and radiant heat load are severe, use a U-value of 0.48 W/(m²•K)[0.083 Btu/(h•ft²•°F)].

Design U-values, Winter Conditions[1]

Building Element[2]	Nominal FOAMULAR Insulation Thickness					
	½"	1"	1½"	2"	2½"	3"
Wall:						
Inside girts[3]	0.18	0.12	0.09	0.07	0.06	0.05
Outside girts	0.28	0.16	0.11	0.08	0.07	0.06
Ceiling:						
On truss, over top chord on purlins, or under bottom chord	0.29	0.16	0.11	0.08	0.07	0.06

(1) FOAMULAR insulation R-value 5.4 per inch thickness at 40°F.
The U-values in this table are calculated assuming only FOAMULAR insulation is used to insulate the construction. If lower U-values are required, additional insulation products such as batt or blown insulation can be installed to further reduce thermal transmission.
Framing effects vary depending on the construction method used. For assemblies in this table, the framing effect is minimized since framing members bridging through the foam insulation layer is minimal.
See schematic construction drawings on page 5 for additional information on using FOAMULAR insulation in agricultural building construction.

(2) All values include interior and exterior surface resistances appropriate for the application as defined by ASHRAE.

(3) Includes R-value of 1.84 for 1½" reflective air space as defined by ASHRAE.

Analyzing Your Savings *(No Insulation vs. 1" FOAMULAR Insulation)*

Broiler House Heat Loss Analysis

FOAMULAR insulation positively affects both heat gain and heat loss. In the gain department, consider this example:

Heat Gain Analysis	No Insulation & 1" FOAMULAR Insulation
Roof area (sq ft)	16,000
"U" (Btu/sq ft/hr/°F)	1.16
Equivalent temperature differential (ETD)	60
Heat gain (Btu/hr)*	1,113,600

*Heat gain = roof area x "U" x ETD

House Dimensions	No Insulation & 1" FOAMULAR Insulation
Length (ft)	400
Width (ft)	40
Wall height (ft)	7
Peak height (ft)	15
Window area (sq ft)	3,200

Growing Conditions	No Insulation & 1" FOAMULAR Insulation
Avg. outside temperature (°F)	40
Number broilers	20,000
Grow period (wks)	8
LPG cost ($/gal)	0.65
Fuel conversion rate	0.90

Insulation Specifications

No insulation installed – also insulating value of air spaces created by framing are lost if no insulation layer is present.

1" FOAMULAR insulation – inside sidewall girts and above roof purlins.

Heat Loss Analysis for Growing Period

Week	Fraction House Used	Vent rate (CFM/ Bird)	Inside Temp (°F)	Broiler Heat Gain (Btu/Hr)	Vent Heat Loss (Btu/Hr)	No Insulation & 1" FOAMULAR Insulation Cond. Heat Loss (Btu/Hr)	Total Heat Required (Btu/Hr)
1	0.50	0.010	80	35,000	-8,640	-597,729 (-142,184)	-571,369 (-115,824)
2	0.50	0.010	80	90,000	-8,640	-597,729 (-142,184)	-516,369 (-60,824)
3	0.50	0.200	80	220,000	-172,800	-597,729 (-142,184)	-550,529 (94,984)
4	0.75	0.250	75	320,000	-189,000	-770,197 (-180,457)	-639,197 (-49,457)
5	0.75	0.300	75	420,000	-226,800	-770,197 (-180,457)	-576,997 (12,743)
6	1.00	0.350	70	420,000	-226,800	-878,641(-195,324)	-685,441 (-2,124)
7	1.00	0.450	70	560,000	-291,600	-878,641 (-195,324)	-610,241 (73,076)
8	1.00	0.500	70	560,000	-324,000	-878,641(-195,324)	-642,641 (40,676)

After Heat Loss

R-values	No Insulation	1" FOAMULAR Insulation
Sidewall	0.85	8.09
Endwall	0.85	8.09
Window	0.95	0.95
Curtain	1.46	1.46
Ceiling	0.78	6.19

Conduction Heat Loss per Building Element (%)

	No Insulation	1" FOAMULAR Insulation
Sidewall	9.61	4.25
Endwall	3.22	1.42
Windows	11.40	49.54
Curtain	0.95	4.14
Ceiling	74.82	40.65

In other words, FOAMULAR insulation, in this example, reduces heat gain by approximately 85 percent. Perhaps you can calculate for yourself how that translates into healthier and heavier birds.

When it comes to prevention of heat loss, your cold-weather concern, FOAMULAR insulation once again provides a bottom-line contribution. Compared to an uninsulated poultry house, one with FOAMULAR insulation may well cost less that 10 percent as much in supplemental heating cost.

Supplemental Heat Required for Growing Period (Btu)

No Insulation	1" FOAMULAR Insulation
805,187,712	54,299,784

Supplemental Heating Cost for Growing Period ($)

No Insulation	1" FOAMULAR Insulation
$6,355.46	$428.60

Notes

This analysis is based on the few static variables shown. Data and formulas used to construct these examples are contained in the 1997 ASHRAE Handbook of Fundamentals, chapters 9, 23 and 25. Actual operating costs and broiler productivity will vary from this model since actual operating conditions are constantly changing and the interaction between variables is complex. Therefore this model is intended to compare insulation options only, and does not predict or guarantee actual operating costs.

1" FOAMULAR Insulation – FOAMULAR insulation above purlin insulation is commonly specified in 1½" thickness in the U.S.

For Poultry Houses and Other Agricultural Construction Applications

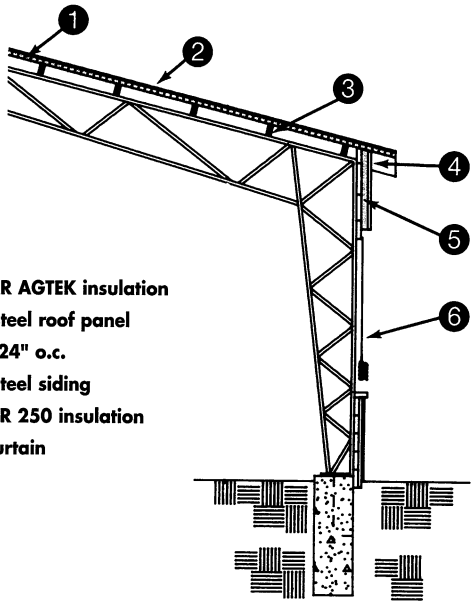
FOAMULAR® Extruded Polystyrene Insulation

Typical Installation of FOAMULAR Insulation in Agricultural Building Construction

The construction drawings here show typical ways to install FOAMULAR insulation in agricultural buildings. Drawings show FOAMULAR insulation over the purlin in standard roof construction and under trusses in drop ceiling construction. FOAMULAR insulation is also shown applied inside or outside of girt sidewall framing. All configurations can be used with rigid steel-frame or wood-frame construction as shown.

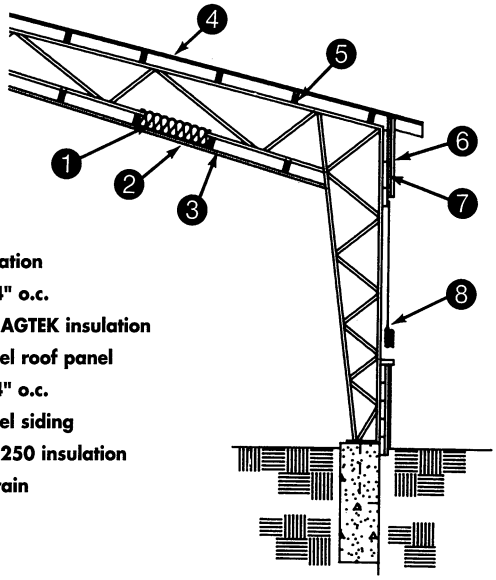
FOAMULAR insulation is typically nailed or stapled to purlins or girts. Best holding power is accomplished using standard large-headed roofing nails. If fibrous insulation is to be installed over FOAMULAR insulation in a drop ceiling application, additional support should be provided to the ceiling. This may include strapping, wood furring or sufficiently large-headed mechanical fasteners to insure that fasteners will not pull through the FOAMULAR insulation.

Purlins with Steel Roofing/Steel Frame



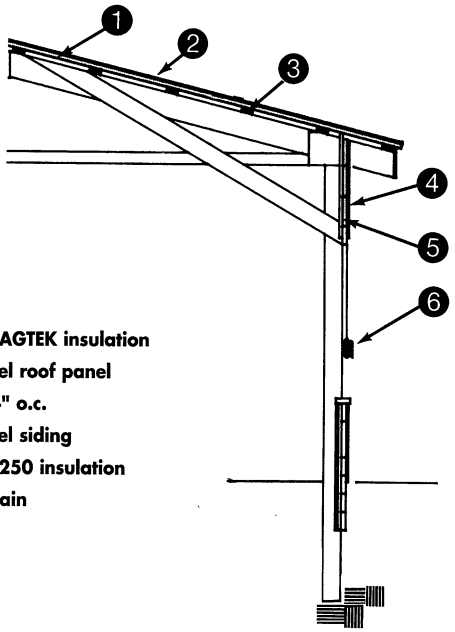
1. 1" FOAMULAR AGTEK insulation
2. Galvanized steel roof panel
3. 2 x 4 purlin 24" o.c.
4. Galvanized steel siding
5. 1" FOAMULAR 250 insulation
6. Adjustable curtain

Drop Ceiling/Steel Frame



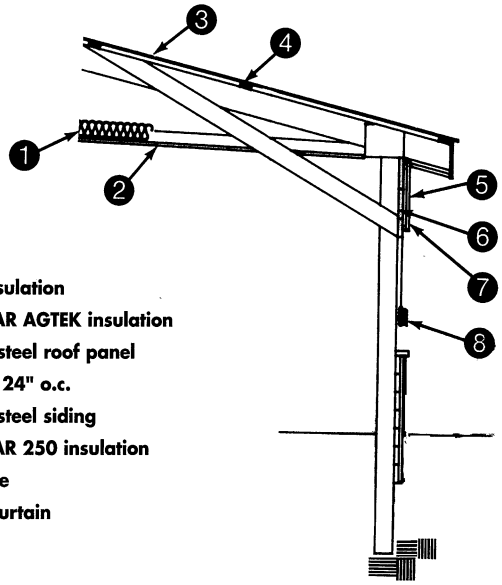
1. 6" blown insulation
2. 2 x 4 purlin 24" o.c.
3. 1" FOAMULAR AGTEK insulation
4. Galvanized steel roof panel
5. 2 x 4 purlin 24" o.c.
6. Galvanized steel siding
7. 1" FOAMULAR 250 insulation
8. Adjustable curtain

Purlins with Steel Roofing/Wood Frame



1. 1" FOAMULAR AGTEK insulation
2. Galvanized steel roof panel
3. 2 x 4 purlin 24" o.c.
4. Galvanized steel siding
5. 1" FOAMULAR 250 insulation
6. Adjustable curtain

Drop Ceiling/Wood Frame (air space)



1. 6" blown insulation
2. 1" FOAMULAR AGTEK insulation
3. Galvanized steel roof panel
4. 2 x 4 purlin 24" o.c.
5. Galvanized steel siding
6. 1" FOAMULAR 250 insulation
7. 1½" air space
8. Adjustable curtain

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