



**Industrial Insulation Group, LLC**

A Calsilite/Johns Manville Joint Venture

**THERMO-12 GOLD® | PIPE & BLOCK INSULATION**

### Economic Thickness of Insulation

The following tables list the Thermo-12 Gold Economic Thickness recommendations (ETI) for pipe and equipment operating at the given process/service temperature and energy cost as determined using the NAIMA 3E-Plus computer program. The following economic and operating parameters were used:

Annual Fuel Inflation.....	5%
Annual Hours of Operation.....	8760 Hours
Interest Rate or Return on Investment.....	10%
Physical Plant Depreciation Period.....	15 years
New Insulation Depreciation Period.....	15 years
Incremental Equipment Investment Rate.....	\$2.00/MMBtu/Hr
Percent of New Insulation Cost for Annual Insulation Maintenance.....	5%
Percent of Fuel Cost for Physical Plant Maintenance.....	5%
Average Ambient Temperature.....	75 °F
Emittance of Outer Jacket.....	0.15 Weathered Aluminum
Emittance of Existing Surface.....	0.90 Steel
Reference Thickness for Payback.....	.0 inches



Process Service Temperature (°F)		150			300			450			600			750			900			1050			1200		
NPS (in.)	Energy Cost (\$/MMBtu)	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10
½	Economic																								
	Thickness (inches)	≤1	1	1	1	1.5	1.5	1	1.5	2.5	1.5	2.5	3	1.5	2.5	3	1.5	3	3	2.5	3	4	2.5	3	4
	Heat Loss (Btu/ft**/hr)	41	10	10	33	27	27	60	50	40	76	60	57	106	84	79	140	104	104	140	132	120	173	163	148
	Surface Temp. (°F)	150	90	90	117	104	104	143	121	102	140	112	107	160	124	117	181	127	127	149	138	125	162	150	134
	Payback (Years)	0	10.2	5.1	6.1	1.9	1.1	2.4	0.8	0.7	1.4	0.6	0.4	0.9	0.4	0.3	0.6	0.3	0.2	0.5	0.2	0.1	0.4	0.1	0.1
	Annual Cost (\$/ft**/yr)	0.96	2.42	2.86	2.51	3.9	5.17	3.14	5.48	7.36	3.76	6.95	9.7	4.46	8.59	12.26	5.25	10.34	15.16	6.01	12.29	17.65	6.78	14.45	20.93
Total Savings (\$/ft**/yr)	0	0.4	1.9	1.4	7.9	14.5	5.2	19.6	34.5	10.9	37	63.6	19	61.7	105.00	30.2	95.6	162.00	45.4	142.00	239.00	65.6	203.00	341.00	
1	Economic																								
	Thickness (inches)	≤1	1	1	1	1.5	1.5	1	2.5	2.5	1.5	2.5	3	1.5	3	3	2	3	4	2.5	3	5	2.5	4	5
	Heat Loss (Btu/ft**/hr)	61	12	12	41	34	34	75	50	50	95	76	70	133	98	98	153	129	115	176	163	127	218	180	157
	Surface Temp. (°F)	150	91	91	118	107	107	146	107	107	147	120	113	169	125	125	165	137	123	164	150	116	180	144	124
	Payback (Years)	0	5.9	3.2	3.08	1.3	0.8	1.6	0.8	0.5	1	0.4	0.3	0.6	0.3	0.2	0.5	0.2	0.2	0.4	0.1	0.1	0.2	0.1	0.1
	Annual Cost (\$/ft**/yr)	1.41	2.64	3.2	2.75	4.47	6.06	3.55	6.38	8.69	4.31	8.19	11.55	5.18	10.2	14.74	6.14	12.36	18.2	7	14.77	20.71	7.97	17.41	24.19
Total Savings (\$/ft**/yr)	0	1.6	3.8	3.1	13	23.1	8.9	31	53.5	17.6	57.6	98.2	30.1	95.6	162	47.3	148	249	70.9	219	369	102	312	525	
1½	Economic																								
	Thickness (inches)	≤1	1	1	1	2	2.5	1.5	2.5	2.5	2	2.5	3	2	3	4	2	3	4	2.5	4	4	2.5	4	4
	Heat Loss (Btu/ft**/hr)	84	15	15	52	35	31	78	58	58	96	88	82	134	113	100	177	149	132	205	167	167	253	207	207
	Surface Temp. (°F)	150	93	93	123	99	95	132	108	108	130	121	114	146	126	114	164	139	124	165	134	4	182	145	145
	Payback (Years)	0	4	2.3	2.7	1.1	0.8	1.3	1.1	0.8	1.3	0.6	0.3	0.9	0.3	0.2	0.5	0.2	0.2	0.3	0.1	0.1	0.2	0.1	0.1
	Annual Cost (\$/ft**/yr)	1.96	2.94	3.65	3.09	5.13	6.71	4.03	7.11	9.79	4.95	9.21	13.05	5.83	11.48	16.7	6.82	13.98	20.37	7.83	16.72	23.48	8.96	19.47	28.06
Total Savings (\$/ft**/yr)	0	2.9	6.2	5.1	19.3	34.1	13.5	45.4	77.7	26	83.7	142	44.1	138	233	69.2	214	360	103	316	531	148	451	756	
2	Economic																								
	Thickness (inches)	1	1	1.5	1	1.5	2.5	1.5	2.5	3	1.5	3	4	2.5	3	4	2.5	4	4	2.5	4	5	3	4	5
	Heat Loss (Btu/ft**/hr)	18	18	14	61	49	38	89	68	63	136	95	83	145	133	115	191	151	151	243	192	174	274	237	215
	Surface Temp. (°F)	94	94	88	125	111	98	133	113	107	157	120	109	144	133	119	161	130	130	178	141	129	179	154	139
	Payback (Years)	13.1	3.1	2	2.1	0.07	0.6	1	0.5	0.3	0.6	0.3	0.2	0.5	0.2	0.1	0.3	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1
	Annual Cost (\$/ft**/yr)	2.27	3.1	3.85	3.27	5.57	7.37	4.25	7.78	10.79	5.34	10.16	14.43	6.38	12.75	18.16	7.45	15.36	22.38	8.65	18.2	26.14	9.89	21.35	30.89
Total Savings (\$/ft**/yr)	0.1	4.1	8.2	6.8	24.7	43	17.4	57.2	97.5	33.1	105	178	55.7	173	292	87.1	268	451	130	397	665	186	566	948	
3	Economic																								
	Thickness (inches)	1	1	1.5	1.5	2.5	2.5	1.5	2.5	3	2.5	3	4	2.5	4	4	2.5	4	5	3	4	6	3	5	6
	Heat Loss (Btu/ft**/hr)	24	24	19	64	48	48	117	87	79	133	120	102	185	142	142	244	187	165	280	237	193	346	259	238
	Surface Temp. (°F)	95	95	90	114	101	101	139	117	110	133	125	113	151	124	124	170	136	124	172	149	125	190	144	134
	Payback (Years)	9.4	2.4	1.6	1.9	0.8	0.5	0.8	0.4	0.3	0.6	0.2	0.2	0.4	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
	Annual Cost (\$/ft**/yr)	2.72	3.82	4.73	4.03	6.83	9.05	5.27	9.58	13.26	6.59	12.46	17.61	7.8	15.64	22.23	9.17	18.77	27.19	10.59	22.28	30.21	12.13	26.06	35.48
Total Savings (\$/ft**/yr)	0.7	6.5	12.5	10.4	36.4	63	25.8	83.6	142	48.7	153	259	81.7	253	425	127	391	656	189	578	970	271	824	1382	
4	Economic																								
	Thickness (inches)	1	1	1.5	1.5	2.5	3	1.5	3	3	2	3	4	3	4	4	3	4	5	3	4	6	3	5	6
	Heat Loss (Btu/ft**/hr)	28	28	23	76	56	50	141	91	91	180	139	118	193	134	164	255	217	190	324	275	220	400	297	272
	Surface Temp. (°F)	95	95	91	116	102	98	142	112	112	149	126	115	142	127	127	158	139	126	176	153	128	194	149	138
	Payback (Years)	7.5	2	1.4	1.6	0.7	0.5	0.7	0.4	0.2	0.5	0.2	0.2	0.4	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
	Annual Cost (\$/ft**/yr)	3.01	4.33	5.4	4.56	7.87	10.3	6.05	10.85	15.09	7.58	14.17	19.87	8.98	17.59	25.22	10.41	21.22	30.62	12.01	25.29	34.01	13.79	29.32	40.02
Total Savings (\$/ft**/yr)	1.3	8.7	16.3	13.7	46.9	80.9	33.4	107	182	62.7	197	331	105	324	544	164	501	840	243	740	1242	348	1056	1769	
6	Economic																								
	Thickness (inches)	1	1.5	1.5	1.5	2.5	3	2	3	4	2.5	4	4	3	4	5	3	4	6	4	5	6	4	5	9
	Heat Loss (Btu/ft**/hr)	41	31	31	107	75	67	159	122	99	209	151	151	258	210	182	340	277	219	351	305	278	435	343	276
	Surface Temp. (°F)	98	92	92	120	104	100	132	116	106	142	118	118	149	131	120	167	144	123	159	143	134	174	144	123
	Payback (Years)	5.8	1.9	1.1	1.3	0.6	0.4	0.7	0.3	0.2	0.4	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
	Annual Cost (\$/ft**/yr)	3.76	5.49	6.95	5.79	9.88	13.12	7.85	13.86	18.63	9.52	17.62	24.63	11.38	21.73	31.29	13.29	26.38	37.49	15.26	31.35	41.96	17.19	35.99	48.72
Total Savings (\$/ft**/yr)	2.5	13.4	24.5	20.7	69.6	119	49.6	158	269	93	290	488	155	478	801	242	738	1237	359	1091	1828	514	1557	2606	
8	Economic																								
	Thickness (inches)	1.5	1.5	1.5	1.5	2.5	3	2.5	4	4	2.5	4	4	3	4	5	3	4	6	4	5	9	4	6	10
	Heat Loss (Btu/ft**/hr)	38	38	38	129	88	78	161	119	119	246	181	181	304	252	218	401	332	259	421	365	260	521	406	302
	Surface Temp. (°F)	92	92	92	120	104	100	122	107	107	142	120	120	150	134	123	168	148	126	163	147	118	179	148	121
	Payback (Years)	5.5	1.6	0.9	1.1	0.5	0.3	0.7	0.3	0.2	0.4	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1
	Annual Cost (\$/ft**/yr)	4.49	6.25	8.01	6.62	11.47	15.17	9.07	15.97	21.49	11.04	20.29	28.69	13.12	25.22	36.28	15.36	30.79	43.54	17.46	36.36	48.08	19.78	41.77	54.8
Total Savings (\$/ft**/yr)	3.6	18	32.4	27.5	90.7	155	64.8	206	348	121	376	632	202	619	1038	314	956	1602	466	1413	2367	666	2016	3375	

\* Linear feet





**Industrial Insulation Group, LLC**  
A Calsilite/Johns Manville Joint Venture

## Thermo-12 Gold® Pipe & Block Insulation

*Economic Thickness of Insulation*

Process Service Temperature (°F)		150			300			450			600			750			900			1050			1200			
NPS (in.)	Energy Cost (\$/MMBtu)	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	\$2	\$6	\$10	
36	Economic																									
	Thickness (inches)	1.5	2	2	2	3	4	2.5	4	4	4	4	6	4	6	7	4	6	8	4	7	10	4	8	10	
	Heat Loss (Btu/ft <sup>2</sup> /hr)	140	112	112	382	273	210	583	384	384	585	585	432	815	600	522	1074	791	618	1365	873	657	1688	869	812	
	Surface Temp. (°F)	95	91	91	118	106	100	134	115	115	130	130	116	147	128	121	165	141	126	183	144	126	203	148	135	
	Payback (Years)	4.1	1.7	1	1	0.5	0.4	0.5	0.3	0.2	0.4	0.2	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	Annual Cost (\$/ft <sup>2</sup> /yr)	14.76	24.08	29.27	22.33	40.73	51.37	28.96	53.71	71.54	35.34	67.71	91.55	40.66	83.26	109.33	46.68	96.51	126.65	56.64	109.52	131.43	66.15	122.43	149.41	
	Total Savings (\$/ft <sup>2</sup> /yr)	17.4	72	132	114	368	630	268	838	1415	499	1535	2580	831	2532	4250	1293	3923	6573	1914	5807	9730	2741	8299	13885	
48	Economic																									
	Thickness (inches)	1.5	2	2	2	3	4	2.5	4	4	3	4	7	4	6	8	4	7	9	4	8	10	4	8	10	
	Heat Loss (Btu/ft <sup>2</sup> /hr)	184	147	147	501	357	273	763	498	498	998	759	481	1057	772	599	1394	881	715	1771	1000	833	2191	1236	1029	
	Surface Temp. (°F)	95	91	91	118	107	100	135	116	116	148	132	112	149	130	117	167	134	123	186	139	128	206	151	137	
	Payback (Years)	4.1	1.7	1	1	0.5	0.4	0.5	0.3	0.2	0.3	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	Annual Cost (\$/ft <sup>2</sup> /yr)	19.56	31.86	38.67	29.56	53.87	67.94	38.3	70.98	94.11	46.85	89.16	118.14	53.89	107.56	139.47	61.71	123.64	161.39	77.4	139.66	167.19	87.78	156.09	189.96	
	Total Savings (\$/ft <sup>2</sup> /yr)	23.1	96	174	151	486	836	256	1113	1880	663	2040	3430	1105	3369	5655	1720	5222	8747	2546	7731	12950	3648	11049	18485	
Flat	Economic																									
	Thickness (inches)	1	1.5	2	2	4	4	2.5	4	4	3	4	6	4	6	9	4	6	10	4	9	10	4	10	10	
	Heat Loss (Btu/ft <sup>2</sup> /hr)	19	14	11	37	20	20	57	37	37	74	56	39	79	54	36	104	71	43	132	61	55	163	68	68	
	Surface Temp. (°F)	100	95	91	119	102	102	136	118	118	150	135	120	154	133	118	173	147	124	193	139	134	215	145	145	
	Payback (Years)	6.8	2	1.3	1.5	0.7	0.4	0.7	0.3	0.2	0.4	0.2	0.1	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
	Annual Cost (\$/ft <sup>2</sup> /yr)	2.19	2.92	3.44	3.04	4.44	5.38	3.72	5.61	7.33	4.34	6.96	9.04	4.85	8.3	10.66	5.43	9.49	11.94	6.09	10.67	11.06	6.81	11.64	12.57	
	Total Savings (\$/ft <sup>2</sup> /yr)	1.2	7.3	13.5	11.4	38.9	66.8	27.8	88.9	150	52.3	163	274	88.7	269	452	137	417	700	204	618	1037	292	884	1480	

\* Linear feet

Industrial Insulation Group, LLC is a Calsilite/Johns Manville joint venture. IIG manufactures MinWool-1200® mineral fiber pipe, block and a variety of other insulations; Thermo-12® Gold Calcium Silicate pipe and block insulation; Super Firetemp® fireproofing board; SprouleWR-1200® Perlite pipe and block insulation; high temperature adhesives, and insulating finishing cement.

The physical and chemical properties presented herein represent typical, average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. Numerical flame spread and smoke developed ratings are not intended to reflect hazards presented by these or any other materials under actual fire conditions. Check with the Customer Service Office to assure current information. All Industrial Insulation Group products are sold subject to the IIG Limited Warranty and Limitation of Remedy. For a copy of the IIG Limited Warranty and Limitation of Remedy, email - info@iig-llc.com.



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