analysis for both house design types

The UNIVARIATE Procedure
Variable: gas
type = extra

summary of gas consumption for the 14 houses with extra insulation

Basic Statistical Measures			
Location		**Variability**	
Mean	13.87143	**Std Deviation**	2.36364
Median	13.70000	**Variance**	5.58681
Mode	13.70000	**Range**	10.50000
		Interquartile Range	2.30000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.93277	**Pr < W**	0.3335
Kolmogorov-Smirnov	**D**	0.16723	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.085422	**Pr > W-Sq**	0.1649
Anderson-Darling	**A-Sq**	0.507886	**Pr > A-Sq**	0.1721

Test for normality assumption for the houses with extra insulation sample

The null hypothesis is that the data (the 14 gas consumption values) form a random sample from a normal distribution. The large P-value .3335 shows supports for the normality assumption.

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	18.8
99%	18.8
95%	18.8
90%	16.0
75% Q3	15.3
50% Median	13.7
25% Q1	13.0
10%	11.7
5%	8.3
1%	8.3
0% Min	8.3

The distribution is reasonably symmetric

med-min=5.4
max-med=5.1
very slight skewness to the left

Extreme Values					
Lowest			**Highest**		
Order	**Value**	**Freq**	**Order**	**Value**	**Freq**
1	8.3	1	9	14.6	1
2	11.7	1	10	15.3	1
3	12.7	1	11	15.6	1
4	13.0	1	12	16.0	1
5	13.4	1	13	18.8	1

The UNIVARIATE Procedure
Variable: gas
type = standard

summary of gas consumption for the 12 houses with standard insulation

Basic Statistical Measures			
Location		Variability	
Mean	16.76667	Std Deviation	2.99586
Median	18.00000	Variance	8.97515
Mode	13.90000	Range	10.30000
		Interquartile Range	5.00000

Note: The mode displayed is the smallest of 3 modes with a count of 2.

Tests for Normality				
Test	Statistic		p Value	
Shapiro-Wilk	W	0.927281	Pr < W	0.3522
Kolmogorov-Smirnov	D	0.243046	Pr > D	0.0483
Cramer-von Mises	W-Sq	0.097949	Pr > W-Sq	0.1076
Anderson-Darling	A-Sq	0.514106	Pr > A-Sq	0.1574

Test for normality assumption for the houses with standard insulation sample

The null hypothesis is that the data (the 12 gas consumption values) form a random sample from a normal distribution. The large P-value .3522 shows supports for the normality assumption.

Quantiles (Definition 5)	
Level	Quantile
100% Max	21.70
99%	21.70
95%	21.70
90%	19.00
75% Q3	18.95
50% Median	18.00
25% Q1	13.95
10%	13.90
5%	11.40
1%	11.40
0% Min	11.40

The distribution is slightly skewed to the left but reasonably symmetric (The Shapiro-Wilk test supports this claim)

med-min=6.6
max-med=3.7
slight skewness to the left

Extreme Values					
Lowest			Highest		
Order	Value	Freq	Order	Value	Freq
1	11.4	1	5	18.0	2
2	13.9	2	6	18.1	1
3	14.0	1	7	18.9	1
4	15.3	1	8	19.0	2
5	18.0	2	9	21.7	1

The TTEST Procedure

Variable: gas

sample means and standard deviations

type	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
extra		14	13.8714	2.3636	0.6317	8.3000	18.8000
standard		12	16.7667	2.9959	0.8648	11.4000	21.7000
Diff (1-2)	Pooled		-2.8952	2.6720	1.0512		
Diff (1-2)	Satterthwaite		-2.8952		1.0710		

pooled sample standard deviation

check for common population variance:

The ratio of the sample standard deviations 13.8714/16.7667 =.8273 is between 1/2 and 2
so the assumption of a common population variance is OK

type	Method	Mean	95% CL Mean	
extra		13.8714	12.5067	15.2362
standard		16.7667	14.8632	18.6701
Diff (1-2)	Pooled	-2.8952	-5.0648	-0.7257
Diff (1-2)	Satterthwaite	-2.8952	-5.1234	-0.6670

95% confidence interval for u_(extra) - mu_(standard)

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	24	-2.75	0.0110
Satterthwaite	Unequal	20.848	-2.70	0.0134

.0110 is the P-value for
H_1: mu_(extra) notequal mu_(standard)

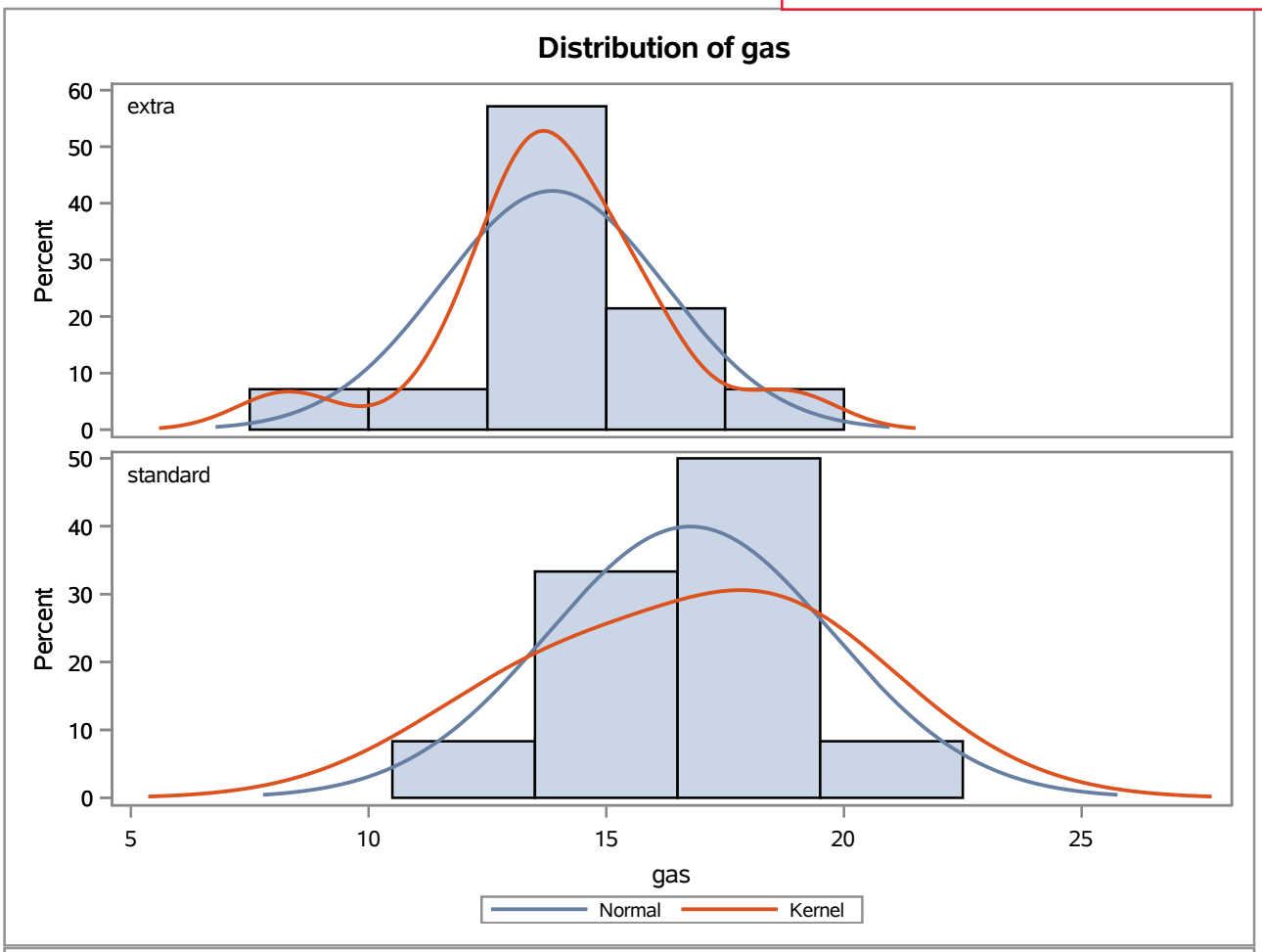
divide by 2 to get the P-value .0055 for
H_1: mu_(extra) < mu_(standard)

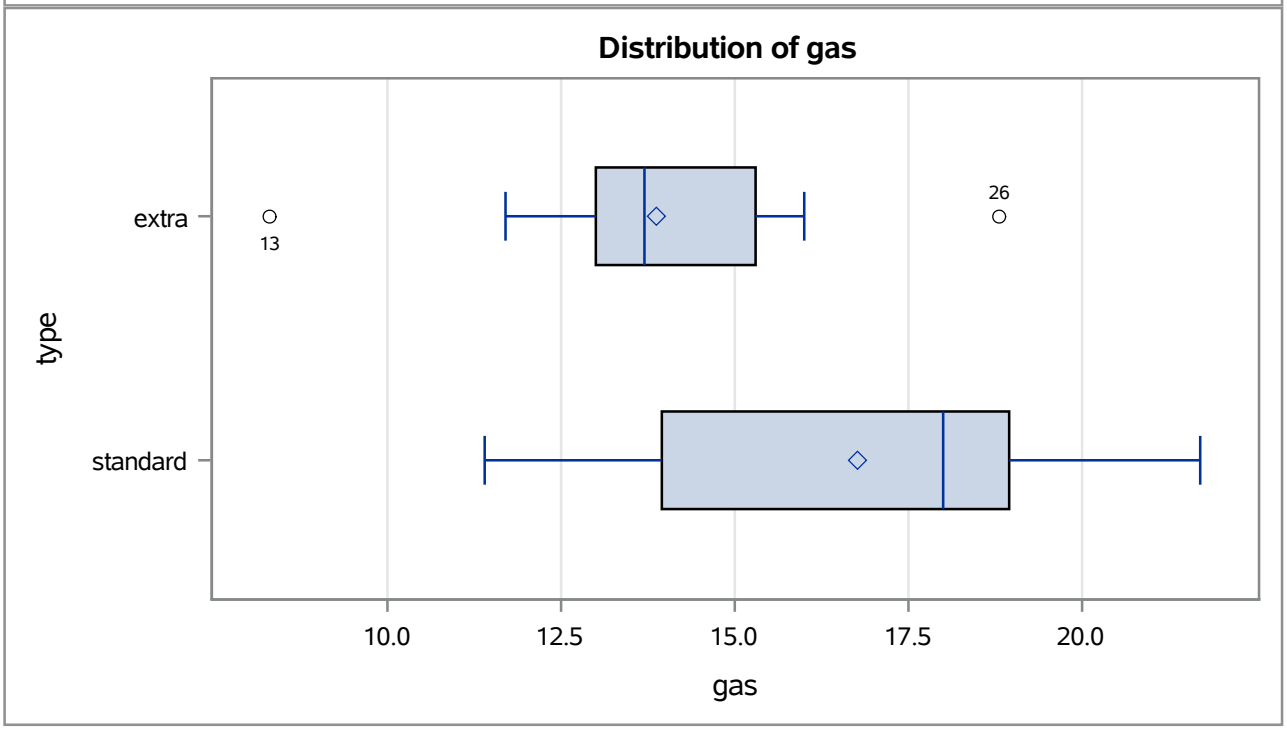
Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	11	13	1.61	0.4127

The TTEST Procedure

Variable: gas

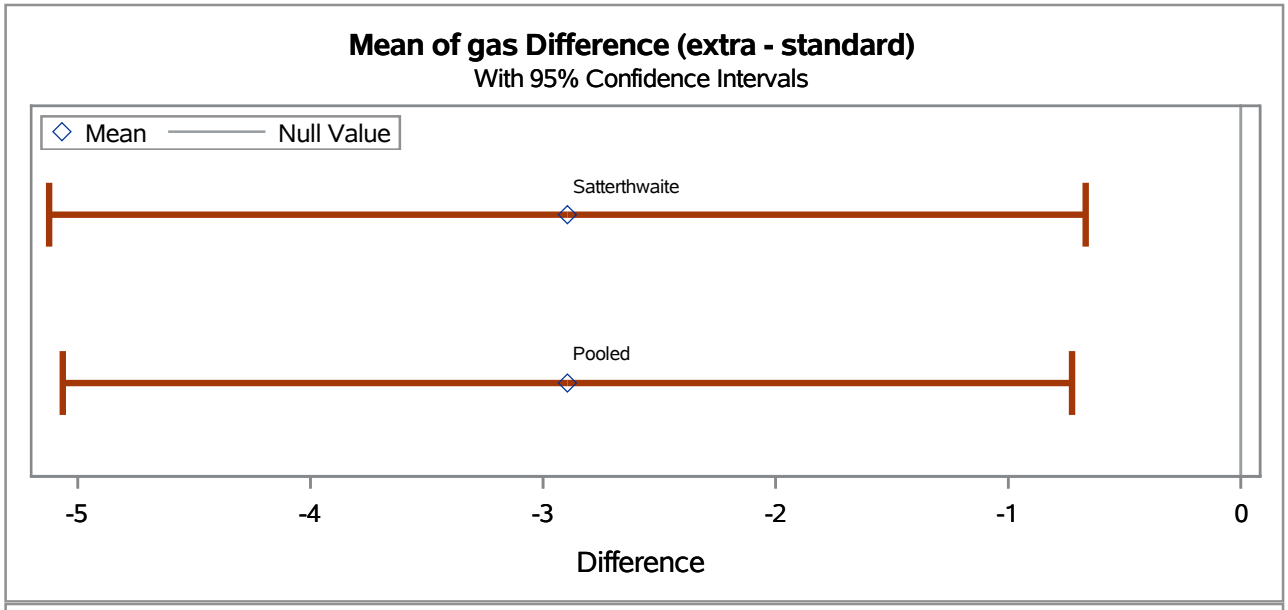
Histograms with smoothed histograms (fitted density curves "kernel") and fitted normal density curves for each sample.

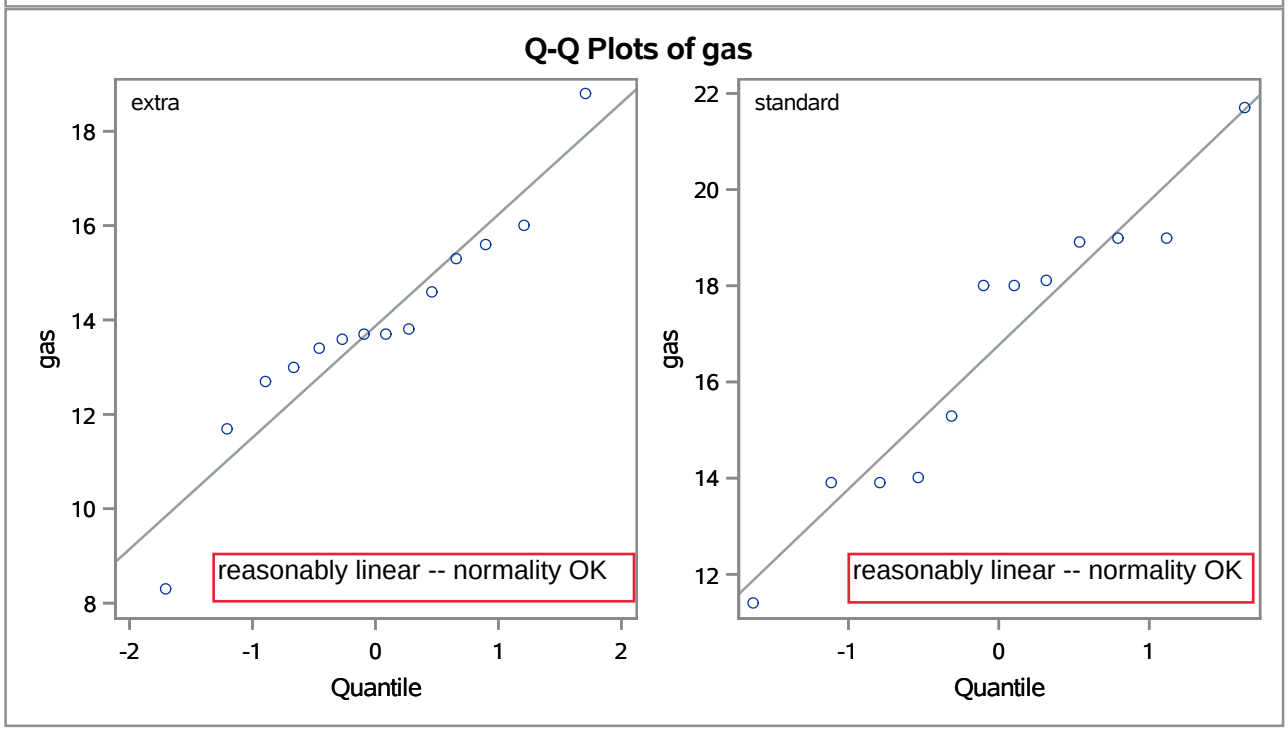




The TTEST Procedure

Variable: gas





The UNIVARIATE Procedure
Variable: gas
type = extra

summary of gas consumption for the 11 solar design houses with extra insulation

Basic Statistical Measures			
Location		**Variability**	
Mean	14.22727	**Std Deviation**	2.72253
Median	14.50000	**Variance**	7.41218
Mode	15.70000	**Range**	8.50000
		Interquartile Range	4.30000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.956073	**Pr < W**	0.7219
Kolmogorov-Smirnov	**D**	0.128473	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.033874	**Pr > W-Sq**	>0.2500
Anderson-Darling	**A-Sq**	0.227742	**Pr > A-Sq**	>0.2500

Test for normality assumption for the houses with extra insulation sample

The null hypothesis is that the data (the 11 gas consumption values) form a random sample from a normal distribution. The large P-value .7219 shows supports for the normality assumption.

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	19.0
99%	19.0
95%	19.0
90%	17.6
75% Q3	15.7
50% Median	14.5
25% Q1	11.4
10%	11.3
5%	10.5
1%	10.5
0% Min	10.5

The distribution is reasonably symmetric (The Shapiro-Wilk test supports this claim)

med-min=4
max-med=4.5

Extreme Values					
Lowest			**Highest**		
Order	**Value**	**Freq**	**Order**	**Value**	**Freq**
1	10.5	1	6	14.5	1
2	11.3	1	7	15.2	1
3	11.4	1	8	15.7	2
4	12.6	1	9	17.6	1
5	13.0	1	10	19.0	1

The UNIVARIATE Procedure
Variable: gas
type = standard

summary of gas consumption for the 16 solar design houses with standard insulation

Basic Statistical Measures			
Location		**Variability**	
Mean	16.13750	**Std Deviation**	2.07906
Median	16.40000	**Variance**	4.32250
Mode	.	**Range**	7.60000
		Interquartile Range	3.35000

Tests for Normality				
Test	**Statistic**		**p Value**	
Shapiro-Wilk	**W**	0.959144	**Pr < W**	0.6463
Kolmogorov-Smirnov	**D**	0.132841	**Pr > D**	>0.1500
Cramer-von Mises	**W-Sq**	0.054795	**Pr > W-Sq**	>0.2500
Anderson-Darling	**A-Sq**	0.337386	**Pr > A-Sq**	>0.2500

Test for normality assumption for the houses with standard insulation sample

The null hypothesis is that the data (the 16 gas consumption values) form a random sample from a normal distribution. The large P-value .6463 shows supports for the normality assumption.

Quantiles (Definition 5)	
Level	**Quantile**
100% Max	19.90
99%	19.90
95%	19.90
90%	18.00
75% Q3	17.70
50% Median	16.40
25% Q1	14.35
10%	13.30
5%	12.30
1%	12.30
0% Min	12.30

The distribution is slightly skewed to the left but reasonably symmetric (The Shapiro-Wilk test supports this claim)

med-min=4.1
max-med=3.5
slight skewness to the left

Extreme Values			
Lowest		**Highest**	
Order	**Value**	**Order**	**Value**
1	12.3	12	17.6
2	13.3	13	17.8
3	13.7	14	17.9
4	13.8	15	18.0
5	14.9	16	19.9

The TTEST Procedure

Variable: gas

sample means and standard deviations

type	Method	N	Mean	Std Dev	Std Err	Minimum	Maximum
extra		11	14.2273	2.7225	0.8209	10.5000	19.0000
standard		16	16.1375	2.0791	0.5198	12.3000	19.9000
Diff (1-2)	Pooled		-1.9102	2.3576	0.9234		
Diff (1-2)	Satterthwaite		-1.9102		0.9716		

pooled sample standard deviation

check for common population variance:

The ratio of the sample standard deviations
2.7225/2.0791 = 1.3095
is between 1/2 and 2
so the assumption of a common population variance is OK

type	Method	Mean	95% CL Mean	
extra		14.2273	12.3983	16.0563
standard		16.1375	15.0296	17.2454
Diff (1-2)	Pooled	-1.9102	-3.8120	-0.00841
Diff (1-2)	Satterthwaite	-1.9102	-3.9537	0.1333

95% confidence interval for mu_(extra) - mu_(standard)

Method	Variances	DF	t Value	Pr > |t|
Pooled	Equal	25	-2.07	0.0491
Satterthwaite	Unequal	17.726	-1.97	0.0652

Equality of Variances				
Method	Num DF	Den DF	F Value	Pr > F
Folded F	10	15	1.71	0.3344

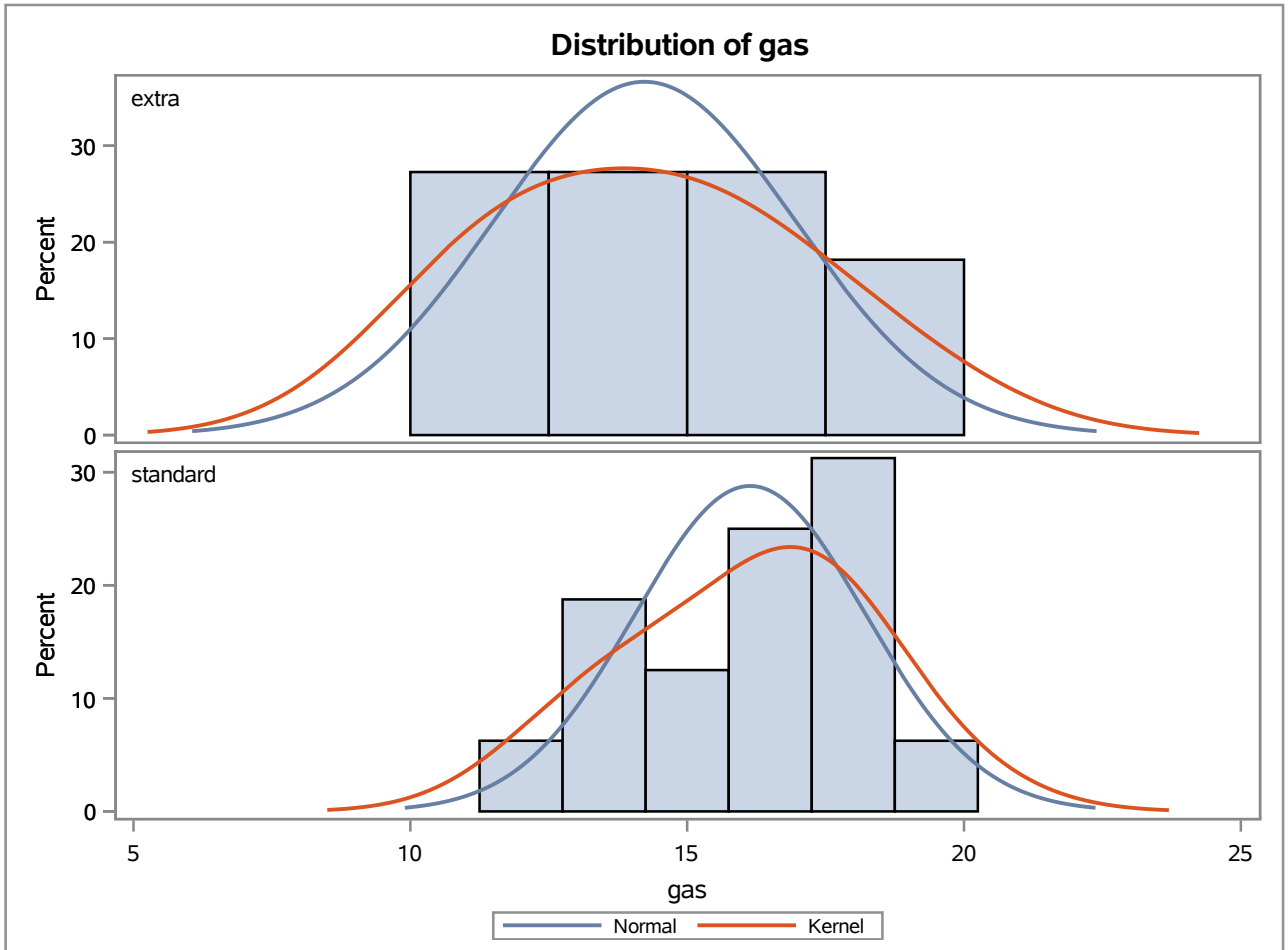
.0491 is the P-value for
H_1: mu_(extra) notequal mu_(standard)

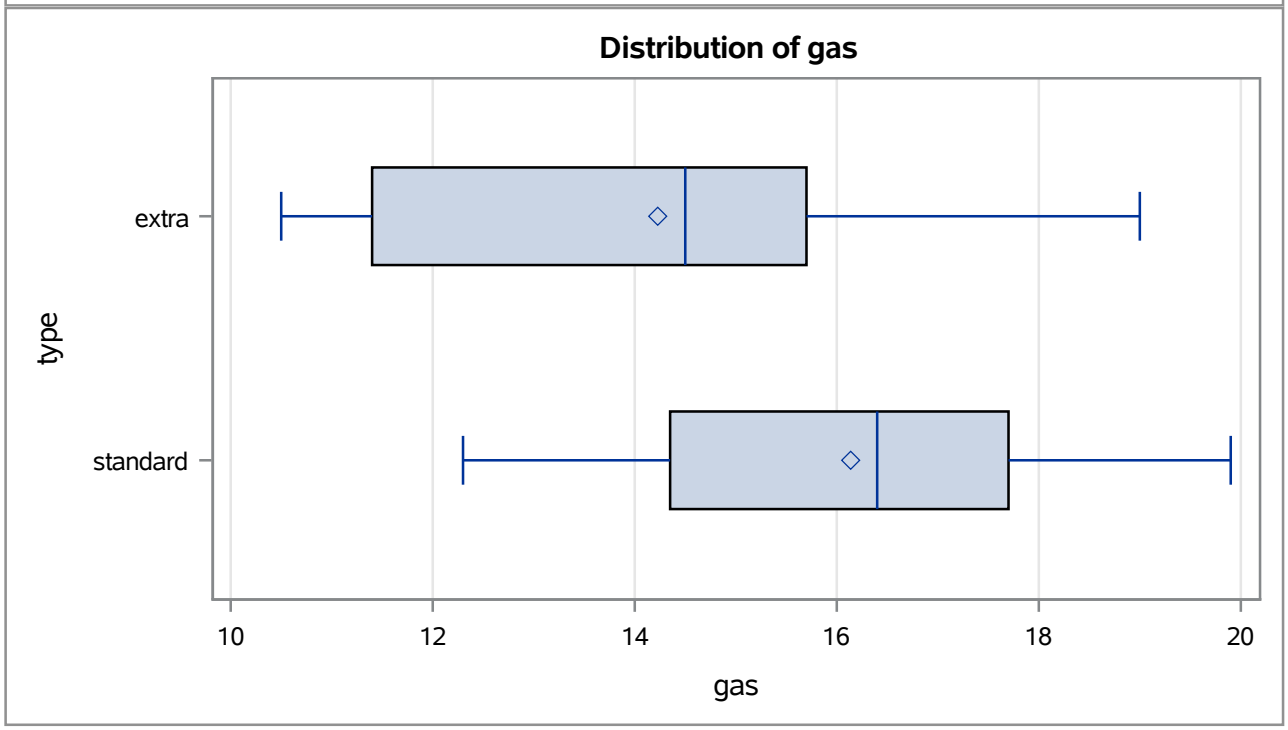
divide by 2 to get the P-value .02455 for
H_1: mu_(extra) < mu_(standard)

The TTEST Procedure

Variable: gas

Histograms with smoothed histograms (fitted density curves "kernel") and fitted normal density curves for each sample.





energy usage summary (solar house designs)

The TTEST Procedure

Variable: gas