CONTRACT

NO. N62470-85-C-8040

DEPARTMENT OF THE NAVY

ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511-6287

CENTRAL AND BUILDING STEAM DISTRIBUTION SYSTEMS AND STEAM TRAP SURVEY

AT

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

BY

CHAS. T. MAIN, INC.

CSDS AND BSDS SURVEY

MARINE CORPS BASE
CAMP LEJEUNE

VOLUME

1

Media Form

- ☐ VHS Tapes
- ☐ Disk
- ☐ Negatives
- ☐ Microfilm
- ☑ Microfiche
- ☐ Other ___________

Titles on Media:

- N62470-85-C-8040
Central & Bldng STM DIST SYS & STM
TRAP Surveys - Marine Corps Base,
Camp Lejeune 1-4
- N62470-85-C-8040 Marine Corps Base,
Camp Lejeune 2-4
- N62470-85-C-8040 Marine Corps Base,
Camp Lejeune 3-4
- N62470-85-C-8040 Marine Corps Base,
Camp Lejeune 4-4
- Appendices A-F
- Mat'l Takeoff New River
- Mat'l takeoff Beach Area
- Mat'l takeoff Camp Geiger 1-3
- Mat'l takeoff Camp Geiger 2-3
- Mat'l takeoff Camp Geiger 3-3

Titles on Media:

- Mat'l takeoff Camp Johnson 1-2
- Mat'l takeoff Camp Johnson 2-2
- Mat'l takeoff Court House Bay
- Mat'l takeoff French Creek
- Mat'l takeoff Hadnot Pt. 1-4
- Mat'l takeoff Hadnot Pt. 2-4
- Mat'l takeoff Hadnot Pt. 3-4
- Mat'l takeoff Hadnot Pt. 4-4
- Mat'l takeoff Hospital Point
- Mat'l takeoff Paradise Point
- Mat'l takeoff Rifle Range
- Insulation New River Air Station 1-2
- Insulation New River Air Station 2-2
- Insulation Beach Area
- Insulation Camp Geiger 1-3
- Insulation Camp Geiger 2-3
- Insulation Camp Geiger 3-3
- Insulation Camp Johnson 1-3
- Insulation Camp Johnson 2-3
- Insulation Camp Johnson 3-3
- Insulation Courthouse Bay

Titles on Media:

- Insulation French Creek
- Insulation Hadnot Pt. 1-9
- Insulation Hadnot Pt. 2-9
- Insulation Hadnot Pt. 3-9
- Insulation Hadnot Pt. 4-9
- Insulation Hadnot Pt. 5-9
- Insulation Hadnot Pt. 6-9
- Insulation Hadnot Pt. 7-9
- Insulation Hadnot Pt. 8-9
- Insulation Hadnot Pt. 9-9
- Insulation Hospital Pt. 1-2
- Insulation Hospital Pt. 2-2
- Insulation Paradise Pt.
- Insulation Rifle Range 1-2
- Insulation Rifle Range 2-2

Media Form

- [ ] VHS Tapes
- [ ] Disk
- [ ] Negatives
- [ ] Microfilm
- [ ] Microfiche
- [x] Other Floppy Disk

Titles on Media:

- Steam Trap Survey Hadnot Point 1st 1105 Traps
- Steam Trap Survey Hadnot Point 2nd 1105 Traps
- Steam Trap Survey Hadnot Point 3rd 1105 Traps
- Steam Trap Survey Hadnot Point 4th 1105 Traps
- Steam Trap Survey Hadnot Point 5th 1105 Traps
- Steam Trap Survey Johnson. DBF HOSPPT. DBF GEIGER. DBF, Beach. DBF, Courthse. DBF
- Steam Trap Survey Airstatn. DBF Paradise. DBF Riflerng. DBF Frnchcrk. DBF

MAIN
1893

CHAS. T. MAIN, INC.

TWO FAIRVIEW PLAZA, 5950 FAIRVIEW RD., P. O. BOX 240236, CHARLOTTE, N. C. 28224, TEL. 704/554-1100

September 17, 1987 1417-48-6000

SUBJECT: Marine Corp Base
Contract No. N62470-85-C-8040
Central and Building Steam
Distribution Systems and
Steam Trap Surveys at the MCB,
Camp Lejeune, Jacksonville, NC

Commander
Atlantic Division
ATTN: Code 111
Naval Facilities Engineering Command
Norfolk, VA 23511-6287

Gentlemen:

We are pleased to present two (2) complete revised sets of the Energy Report and four (4) sets of microfiche for Camp Geiger, Rifle Range, Hadnot Point, Hospital Point, French Creek, Courthouse Bay, Beach Area, Paradise Point, Camp Johnson, and New River Air Station.

The mylars of the BSDS diagrammatic sketches have been previously sent in a separate mailing, and the Steam Trap Report will be sent later. The Energy Report was reissued in its entirety to simplify the insertion of the new information. The revised pages have been identified with an R-1 symbol next to the page number.

A copy of the comments on the draft report and MAIN responses follow this letter. The comments have been numbered for reference purposes.

The final report also contains the Executive Summary which follows the Table of Contents.

If you have any further questions, please advise.

Very truly yours,

CHAS. T. MAIN, INC.

Rogers Howell

Rogers G. Howell, P.E.
Project Manager

RGH/moe

Attachments

RECEIVED
CHAS. T. MAIN, INC.
AUG 26 1987
CHARLOTTE, N. C.

DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511-6287

TELEPHONE NO
(804) 444-9573

IN REPLY REFER TO
11300
1112JDK

20 AUG 1987

Charles T. Main, Incorporated
Two Fairview Plaza
P.O. Box 240316
Charlotte, NC 28224-8836

Re: Contract N62470-85-B-8040, Building Steam Distribution System and Trap Survey at Marine Corps Base, Camp Lejeune and Marine Corps Air Station, Cherry Point

Gentlemen:

The Draft Report for the MARCORB Camp Lejeune has been reviewed and the following comments are provided:

a. Trap data on the floppy disk does not have a separate field for building number. There is a field called "location" which contains the building number and other information related to the location. Please create a separate field called BLDG and dedicate that field for the building number only with alphanumeric designation such as "AS4151" (not BLDG - AS4151).

b. The example calculation for outside air shutoff on page 4-59 of the Draft Energy Report is not clear. The Energy Savings calculation does not equal 69.74 MBTU/YR.

c. The attachments are related to sketches, steam traps, and line lengths. A 100 percent review was not done; therefore, please check other sketches for similar errors.

The overall quality of this report and sketches is very good. Navy review comments related to your other reports will be forwarded as soon as the reviews are complete.

Sincerely,

A J Hansen

A. J. HANSEN, P.E.
Head, Energy and Utilities
Engineering Branch
Utilities, Energy and Environmental
Division
By direction of the Commander

SKETCH #	COMMENT
1. RR1-1	Trap numbers 1674,1675, and 1677 are on CSDS and not in building RR1.
2. RR2-1	Trap numbers 1672,1673, and 1678 are on CSDS and not in building RR2. Trap number 2539 belongs in building RR1.
3. RR4-1	Trap numbers 1669-1671 are on CSDS and not in building RR4.
4. RR5-6,7	Trap number 2236 appears twice. Trap numbers 5695 and 5696 are not on sketches.
5. FC200-1	Trap numbers 3804 and 3820 appear twice.
6. FC251-1	Trap number 3625 appears twice.
7. FC301-1	Trap number 3727 does not belong in building FC301.
8. FC302-1	Trap number 3724 does not belong in building FC302.
9. FC303-2	Trap numbers 3988 and 3989 are not in the survey.
10. FC303-2,3	Trap numbers 3922 and 3974 do not belong in building FC303.
11. H15A	Trap numbers 5103-5113,6181-6199,6301-6312, and 6351-6397 are not on sketches.
12. G650	Trap numbers 5413-5424 and 5993-6000 are listed, but there are no sketches.
13. TC719-1	Trap number 5647 is not in survey.
14. TC749-1	Trap number 5993 is in building G650.
15. TC753-1	Trap numbers 5282 and 5283 are in building TC737.
16. TC1046-1	Trap number 6045 appears twice.
17. AS216-5	Trap number 6331 is in building AS414.
18. AS217-2	Trap number 1353 appears twice.
19. AS217-7,8	Trap numbers 1311 and 1312 appear twice.
20. AS226-1	Trap number 300 belongs in building AS266.
21. AS504-3	Trap number 1984 appears twice.
22. AS518-1	Trap number 1880 is in building AS4100.
23. AS4030-1	Trap numbers 1101-1103 are in building AS4108.
24. AS4035-1	Trap numbers 1106-1108 are in building AS4031.
25. AS4100-1	Trap number 192 is not in survey.
26. AS4106-3,4	Trap number 1892 appears twice.
27. AS4106-6	Trap number 1916 appears twice.
28. AS4108-5	Trap number 193 is not in survey.
29. M90-2	Trap numbers 1539 and 1540 are on CSDS.
30. M127-1	Trap number 876 is in building M104.
31. M301-1	Trap number 3160 is not in survey.
32. M308-1	Trap number 228 is in building M516. Trap number 299 is not in survey.
33. M309-1	Trap number 4115 is in building M324.
34. M406-1	Trap number 3159 is not in survey.
35. M520-1	Trap number 279 appears twice.
36. M602-1	Trap numbers 254-258 are not in survey.
37. M607-1	Trap numbers 659 and 660 are not in survey.
38. BB2-1	It appears that trap number 2984 should be 2964.
39. BB7-2-5	Trap numbers 2991-2993, 3010 are not on sketches.

ATTACHMENT A

	SKETCH #	COMMENT
40.	BB12-1	It appears that trap number 2789 should be 2798.
41.	BB269-1	Trap numbers 3025-3028 are in building BB272.
42.	2-1,4	Trap number 4816 appears twice.
43.	2-3	Trap number 10012 is not in survey.
44.	10-2	Trap number 5039 appears twice.
45.	12-2,3	Trap numbers 4664 and 4675 appear twice.
46.	16-1	It appears that trap numbers 7491 and 7492 should be 7691 and 7692. Trap number 8007 is in building 116. Trap number 8008 is not in survey.
47.	25-2	Trap number 6973 appears twice.
48.	25-3	Trap number 6625 appears twice.
49.	59-3,4	Trap number 6944 appears twice.
50.	60-3,4	Trap number 10068 appears twice.
51.	84-2	Trap numbers 10100 and 10101 appear twice. Trap number 10102 is not in survey.
52.	102-1	It appears that trap numbers 67-73 should be 7267-7273.
53.	205-2	Trap number 4573 appears twice.
54.	211-3	Trap numbers 4544 and 4545 are in building 213, and trap numbers 7533-7543 are in building 111.
55.	216-1	Trap numbers 7625 and 7626 are in building 116.
56.	217-1	It appears that trap numbers 69-77 should be 12169-12177.
57.	304-2	Trap number 10142 is in building 302.
58.	408-4	Trap numbers 12396-12398 are in building 803.
59.	424-2	Trap number 4446 is in building 325.
60.	510-1	Trap numbers 5394 and 5396 are not in survey. Trap number 5394 appears twice.
61.	510-3	Trap numbers 5389-5392 are not in survey.
62.	514-1,2	Trap numbers 5366-5388 are not in survey.
63.	517-2	Trap number 5730 appears twice.
64.	909-2	Trap number 6702 is near building 908 in survey.
65.	910-1	Trap number 8463 is in building 1771.
66.	914-1	Trap number 3467 is in building 1103.
67.	1005-1	Trap number 10322 is not in survey.
68.	1006-1	Trap number 6762 is in building 1120.
69.	1101-1	Trap numbers 10300-10309 are in building 1201.
70.	1116-1	It appears that trap number 3806 should be 3809.
71.	1120-1	Trap numbers 6771-6773 are not in survey.
72.	1200-1	Trap number 3935 appears twice.
73.	1202-3,4	Trap numbers 10342 and 10343 appear twice.
74.	1300-1	Trap numbers 6636, 6637, and 6639 are in building 25.
75.	1304-1	Trap number 10364 is in building 1404.
76.	1400-2	Trap numbers 6411-6418 are in building 411.
77.	1401-1	Trap number 7000 is in building 114.
78.	1403-1	Trap numbers 6647 and 6648 are in building 25.
79.	1502-1	Trap number 6282 appears twice. It appears that trap numbers 6387 and 6391 should be 6287 and 6291.
80.	1611-1	Trap number 6462 is in building 1610.
81.	1706-1	Trap number 6089 is in building 1701.
82.	1770-1	Trap numbers 7438-7440 are not in survey.

	SKETCH #	COMMENT
83.	HP57-1	Trap numbers 7993-8000 are not in survey.
84.	HP105-1	Trap numbers 7974-7976 are not in survey.
85.	HP115-1	Trap numbers 7981-7983 are not in survey.
86.	HP125-1	Trap numbers 7985-7987 are not in survey.
87.	HP127-1	Trap numbers 7979-7981 are not in survey.
88.	HP135-1	Trap numbers 7971-7973 are not in survey.
89.	HP140-1	Trap numbers 7967-7970 are not in survey.
90.	HP145-1	Trap number 7966 is not in survey.
91.	HP155-1	Trap numbers 7988 and 7989 are not in survey.
92.	HP175-1	Trap numbers 7990-7992 are not in survey.
93.	HP255-1	Trap numbers 8021-8023 are in building 226.
94.	S86-1	It appears that building 586 in survey should be S86.
95.	S96-1	It appears that building 596 in survey should be S96.
96.	S1210-1	Trap numbers 6021-6024 are in buildings 1207 1208.
97.	2600-1	Trap number 3283 is in building 2615 and trap number 3244 is in building 2603.
98.	AS4146-1	Line lengths on sketch are missing from listing.
99.	RR2-5	Only 2 line lengths are in listing, actually 24.
100.	RR4-6	Line lengths on sketch are missing from listing.
101.	RR10-1	Line listing does not match sketch. (0-0-5-5)
102.	RR11-8	Line lengths on sketch are missing from listing.
103.	M104-6	Line lengths on sketch are missing from listing.
104.	M112-1	Building M112 has sketch M112-1 only but listing includes lengths for sketch M112-8.
105.	M210-1	Line lengths on sketch are missing from listing.
106.	M305-1	.
107.	M316-1	.
108.	M321-1	.
109.	M324-5	.
110.	M516-1	.
111.	M518-1	.
112.	M522-1	.
113.	M604-1	.
114.	M607-1	.
115.	M609-1	.
116.	M614-1	.
117.	M616-1	.
118.	M622-1	.
119.	TC910-4,5	Sketches for 910-4,5 are poorly copied.
120.	TC1029-1	Line lengths on sketch are missing from listing.
121.	TC1048-1	.
122.	TC1049-1	.
123.	TC1055-1	.
124.	TC1062-1	Line lengths in listing are missing from sketch.

	SKETCH #	COMMENT
125.	TC1110-1	Line lengths on sketch are missing from listing.
126.	TC1119-1	.
127.	BA128-1	.
128.	BB5-1	Line lengths in listing are missing from sketch.
129.	114-1	Line lengths on sketch are missing from listing.
130.	119-1	.
131.	123-1	.
132.	127-1	.
133.	203-1	.
134.	211-2	The symbol 'NT' is not shown on standard drawing.
135.	304-2	Line lengths on sketch are missing from listing.
136.	315-2	.
137.	317-2	.
138.	416-2	.
139.	419-2	.
140.	423-2	.
141.	460-2	Some line lengths have insulation but no thicknesses.
142.	1041-4	Line lengths on sketch are missing from listing.
143.	1041-5	Line lengths in listing are not on sketch.(12')
144.	1104-1	Line lengths on sketch are missing from listing.
145.	1106-1	.
146.	1107-1	.
147.	1120-1	.
148.	1207-1	.
149.	1208-1	.
150.	1209-4	Line lengths are not listed for sketch.
151.	1300-1	Line lengths on sketch are missing from listing.

Response To Comments - Letter Dated August 20, 1987

A. A field entitled "BLDG" has been added to the Hadnot Point file with the building number only being entered. The remaining nine files for Camp Lejeune were prepared by EEC and contain the separate field.

B. The example calculation contained typographical errors. These have been corrected.

C. Responses (Note: Each sketch no. on the comment sheet was numbered.)

1. Agree. This has been corrected.

2. Agree. This has been corrected.

3. Agree. This has been corrected.

4. Agree. This has been corrected.

5. Agree. This has been corrected.

6. Agree. This has been corrected.

7. Agree. This has been corrected.

8. Agree. This has been corrected.

9. Agree. Trap Nos. 3988 and 3989 should be 3688 and 3689.

10. Agree. This has been corrected.

11. Agree. A substantial amount of demolition work is ongoing at the hospital. The area where these traps were located was undergoing demolition between the time of the trap survey and the sketching of the BSDS; therefore, these traps do not appear on the sketches.

12. Agree. These traps are located in the boilerhouse building No. G-650 which was not in the scope of work to be sketched. The traps in the buildings were tested and tagged.

13. Agree. This has been corrected.

14. Agree. Trap No. 5993 should be 5393. This has been corrected.

15. Agree. Trap No. 5282 and 5283 should be 5382 and 5383.

16. Agree. This has been corrected.

17. Agree. This has been corrected.

18. Agree. This has been corrected.

19. Agree. This has been corrected.

20. Agree. This has been corrected.

21. Agree. This has been corrected.

22. Agree. This has been corrected.

23. Agree. This has been corrected.

24. Agree. This has been corrected.

25. Agree. Trap No. 192 should be 1883. This has been corrected.

26. Agree. Trap No. 1892 should be 178. This has been corrected.

27. Agree. This has been corrected.

28. Agree. Trap No. 193 should be 1300. This has been corrected.

29. Agree. This has been corrected.

30. Agree. Trap No. 876 should be 926. This has been corrected.

31. Agree. Trap No. 3160 should be 350. This has been corrected.

32. Agree. Trap No. 228 should be 288. This has been corrected. Trap No. 299 should be 289. This has been corrected.

33. Agree. This has been corrected.

34. Agree. The timing for this project was such that the steam trap analysis was scheduled before the sketching of the BSDS. Discrepancies between the sketches and the trap report resulted from one or more of the following reasons:

   a. Maintenance modifications to facilities after the trap analysis with the addition or deletion of a tested steam trap.
   b. Steam trap tags being removed by facility occupants resulting in a trap being surveyed twice. (All traps found to be untagged during the sketching portion of the project were assumed to be missed and were tested. A trap could be tested twice if the tag was removed.)

   Therefore, a small number of discrepancies between the sketches and the steam trap reports remain which we have been unable to resolve.

35. Agree. Trap No. 279 should be 276. This has been corrected.

36. Traps 254-258 were listed as A254-A258. This has been corrected.

37. Traps 659 and 660 were listed as A659 and A660. This is a characteristic of EEC's numbering system.

38. Agree. This has been corrected.

39. Agree. This has been corrected.

40. Agree. This has been corrected.

41. Agree. This has been corrected.

42. Agree. This has been corrected.

43. Agree. Trap No. 10012 should be 4862. This has been corrected.

44. Agree. Trap No. 5039 should be 5030. This has been corrected.

45. Agree. Trap No. 4675 should be 4677. This has been corrected.

46. Agree. Trap No. 8008 should be 8006. This has been corrected.

47. Agree. This has been corrected.

48. Agree. Trap No. 6625 should be 6125. This has been corrected.

49. Agree. This has been corrected.

50. Agree. This has been corrected.

51. Agree. This has been corrected.

52. Agree. Trap Nos. 67-73 should be 7267-7273. This has been corrected.

53. Agree. Trap No. 4573 should be 4577. This has been corrected.

54. Trap Nos. 4544 and 4545 and 7533-7543 are in Bldg. 111. This has been corrected.

55. Trap Nos. 7625 and 7626 are in Bldg. 216. This has been corrected.

56. Agree. This has been corrected.

57. Agree. This has been corrected.

58. Trap Nos. 12396-12398 are in Bldg. 408. This has been corrected.

59. Trap No. 4446 is in Bldg. 424. This has been corrected.

60. Trap Nos. 5394 and 5396 were mislabeled 5694 and 5696. This has been corrected.

61. Trap Nos. 5389-5392 were mislabeled 5689-5692. This has been corrected.

62. Trap Nos. 5366-5388 were mislabeled 5666-5688. This has been corrected.

63. Agree. This has been corrected.

64. Trap No. 6702 is in Bldg. 909. This has been corrected.

65. Did not locate problem.

66. Trap No. 3467 is in Bldg. No. 914. This has been corrected.

67. Agree. Trap No. 10322 was mislabeled 10320. This has been corrected.

68. Trap No. 6762 should be 6782. This has been corrected.

69. Trap Nos. 10300-10309 are in Bldg. 1011. This has been corrected.

70. Agree. This has been corrected.

71. Agree. See response #34 above.

72. Agree. This has been corrected.

73. Agree. This has been corrected.

74. Agree. This has been corrected.

75. Agree. This has been corrected.

76. Trap Nos. 6411-6418 are in Bldg. 1400. This has been corrected.

77. Trap No. 7000 should be 5700. This has been corrected.

78. Trap No. 6647 and 6648 are in Bldg. 1403. This has been corrected.

79. Agree. This has been corrected.

80. Agree. This has been corrected.

81. Trap No. 6089 is in Bldg. 1706. This has been corrected.

82. Trap Nos. 7438-7440 were mislabeled 1738-1740. This has been corrected.

83. Trap Nos. 7966-8000 were mislabeled 9666-9700. This has been corrected.

84. See response #83.

85. See response #83.

86. See response #83.

87. See response #83.

88. See response #83.

89. See response #83.

90. See response #83.

91. See response #83.

92. See response #83.

93. Trap Nos. 8021-8023 are in HP255. This has been corrected.

94. Agree. This has been corrected.

95. Agree. This has been corrected.

96. Trap Nos. 6021-6024 are in Bldg. S1210. This has been corrected.

97. Trap No. 3283 should be 3293 and Trap No. 3244 should be 3294. This has been corrected.

98. Agree. This has been corrected.

99. Agree. This has been corrected.

100. Agree. This has been corrected.

101. Did not locate problem.

102. Agree. This has been corrected.

103. Agree. This has been corrected.

104. Agree. This has been corrected.

105. Agree. This has been corrected.

106. Agree. This has been corrected.

107. Agree. This has been corrected.

108. Agree. This has been corrected.

109. Agree. This has been corrected.

110. Agree. This has been corrected.

111. Agree. This has been corrected.

112. Agree. This has been corrected.

113. Agree. This has been corrected.

114. Agree. This has been corrected.

115. Agree. This has been corrected.

116. Agree. This has been corrected.

117. Agree. This has been corrected.

118. Agree. This has been corrected.

119. These will be reissued.

120. Agree. This has been corrected.

121. Agree. This has been corrected.

122. Agree. This has been corrected.

123. Agree. This has been corrected.

124. Agree. This has been corrected.

125. Agree. This has been corrected.

126. Agree. This has been corrected.

127. One line is not to be insulated because it is being used as the radiator for the building.

128. The radiator detail is typical for 26 radiators.

129. Agree. This has been corrected.

130. Agree. This has been corrected.

131. Agree. This has been corrected.

132. Agree. This has been corrected.

133. Agree. This has been corrected.

134. Agree. This has been corrected.

135. Agree. This has been corrected.

136. Agree. This has been corrected.

137. Agree. This has been corrected.

138. Agree. This has been corrected.

139. Agree. This has been corrected.

140. Agree. This has been corrected.

141. Agree. This has been corrected.

142. Agree. This has been corrected.

143. Agree. This has been corrected.

144. Agree. This has been corrected.

145. Agree. This has been corrected.

146. Agree. This has been corrected.

147. Agree. This has been corrected.

148. Agree. This has been corrected.

149. Agree. This has been corrected.

150. Agree. This has been corrected.

151. Agree. This has been corrected.

All sketches and the steam trap report were extensively reviewed. Corrections in addition to those listed above have been made. The majority of errors detected were due to typographical errors which have been corrected.

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DESCRIPTION:

Contents

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Confidential Records Management, Inc.
New Bern, NC
1-888-622-4425
9/08

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TABLES

APPENDIXES

TAB PLACEMENT HERE

DESCRIPTION:

Executive

Summary

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New Bern, NC
1-888-622-4425
9/08

EXECUTIVE SUMMARY

TABLE OF CONTENTS

TABLES

EXECUTIVE SUMMARY

ES-1 INTRODUCTION

This final report is submitted in accordance with A & E Contract No. N62470-85-C-8040, Central and Building Steam Distribution Systems and Steam Trap Surveys at (1) Marine Corps Base, Camp Lejeune, North Carolina and (2) Marine Corps Air Station, Cherry Point, North Carolina.

Purpose - The overall objective of this study is to identify and quantify the building steam distribution system and steam condensate return system energy losses and to make and support recommendations of corrective measures and capital improvements which will result in energy and monetary savings to the Government.

Scope of Work - This project was divided into three segements:

A. Central Steam and Condensate Return Distribution System (CSDS)

1. Evaluate the use of electric sump pumps, or other alternatives, versus the existing steam ejector systems in manholes and steam pits.
2. Steam Trap Survey (see below).

B. Building Steam Distribution System and Condensate Return System (BSDS)

1. Inspect, identify and list the physical condition of the BSDS and its components that directly contribute to energy losses.
2. Prepare diagrammatic sketches of the BSDS.
3. Evaluate building steam energy use for energy effective improvements, modifications and/or

alterations including control improvements and additional pipe insulation. Stand alone boiler plant buildings are excluded.

C. Steam Trap Survey

Inspect and tag each steam trap on the CSDS and BSDS.

Field Trips and Surveys

The Marine Corps Base at Camp Lejeune was surveyed during the period December 18, 1986 thru April 18, 1987. A total of 650 buildings were surveyed at this installation as follows:

INSTALLATION	NO. OF BUILDINGS
Beach Area	6
Camp Geiger	147
Camp Johnson	109
Courthouse Bay	25
Rifle Range	10
Paradise Point	17
New River Air Station	49
Hadnot Point	237
French Creek	38
Hospital Point	12

The field survey was performed in two segments. MAIN inspected the BSDS and its components that directly contribute to energy losses and prepared diagrammatic sketches which included information on the pipe size, insulation type and size, estimated lengths of sized pipe, valve locations, trap identification numbers, major steam using components location, PRV stations and CSDS connections.

The steam trap survey and subsequent analysis was performed by the subcontracted firm Armstrong, Inc. at Hadnot Point and by Energy Efficiency Consultants at the remainder of Camp Lejeune under the direction of MAIN. The steam traps were examined using an ultrasonic gun. From this examination, a determination was made concerning the condition of the trap. Other pertinent information regarding the trap installation such as faulty piping practices, misapplied steam traps, and inaccessible trap locations were noted. Each accessible trap was also tagged with an identity tag with a unique identification number and tags were provided for all inaccessible traps.

ES-2 COST AND ENERGY SAVINGS

Energy Conservation Opportunities - A brief summary of each ECO investigated is as follows:

4.2 Replace Steam Manhole Ejectors (CSDS) - This opportunity replaces the existing manhole steam ejectors which have been discontinued by the manufacturer resulting in a very high cost maintenance problem due to parts being available on a special order basis only. The replacement is a syphon jet pump which consists of a thermodynamic trap and a steam syphon. The primary savings is due to a reduced maintenance cost with a minimal energy savings. The total cost of installation for 400 manholes is $187,200 which will results in a cost savings of $193,600/yr and a Savings to Investment Ratio (SIR) of 7.8.

4.3 Upgrade Pipe Insulation - This ECO upgrades the current insulation thicknesses from the existing bare pipe or substandard levels to thicknesses recommended by ASHRAE. Preformed fiberglass insulation of the appropriate thickness would be installed on the bare lines or added over the existing insulation to reach the recommended thicknesses. A total construction cost of $1,307,352 would result in an energy savings of 251,319 MBtu/yr. which is equivalent to $620,041/yr. with an SIR of 6.3. The installation breakdown is shown in Table ES-1.

4.4 Night Setback - This is the first of three control opportunities investigated. This ECO would install night setback controls to limit the operation of the heating systems during the unoccupied hours. This ECO would be applicable to 86 buildings at a construction cost of $202,045 with an energy savings of 21,723 MBtu/yr. which is equivalent to $49,821/yr. with an SIR of 2.5. This ECO was combined with the other two control modifications. See paragraph 4.7, Combined Controls.

TABLE ES-1

UPGRADE PIPE INSULATION SUMMARY

INSTALLATION	ENERGY SAVINGS MBTU/YR.	$/YR.	CAPITAL COST $	SIR
BEACH AREA	3,938.427	11,461	18,944	8.15
HOSPITAL POINT	47,366.701	105,628	176,033	8.07
COURTHOUSE BAY	7,817.901	22,750	42,770	7.15
CAMP GEIGER	27,855.980	81,061	153,254	7.11
RIFLE RANGE	12,104.915	35,225	67,224	7.05
CAMP JOHNSON	16,839.867	49,004	103,385	6.37
AIR STATION	15,178.842	44,170	101,880	5.83
HADNOT POINT	113,487.252	253,077	598,027	5.69
PARADISE POINT	3,910.616	11,380	27,100	5.65
FRENCH CREEK	2,818.575	6,285	18,735	4.50
TOTAL	251,319.076	620,041	1,307,352	6.38

4.5 Outside Air Limit Shutoff - This ECO would install controls to shut off the steam supply to the buildings during periods of mild weather in the heating season. This ECO would be applicable to 32 buildings at a construction cost of $42,408 with an energy savings of 2,524 MBtu/yr. which is equivalent to $6,532/yr. with an SIR of 1.6. This ECO was combined with the other two control modifications. See paragraph 4.7, Combined Controls.

Hot Water Outside Air Reset - This ECO would install controls to change the hot water temperature supplied to the buildings to match the actual heating load. This ECO, also has an SIR less than 1.0 for all buildings, but when combined with the other control options, it became viable. See paragraph 4.7, Combined Controls.

Combined Control ECO - The ECO would install controls to provide all control strategies discussed in the preceding three paragraphs. The cost of combining the three control systems does not exceed the cost of a single control system by a large amount due to the duplication of components. This ECO would be applicable to 128 buildings at a construction cost of $283,334 with an energy savings of 32,172 MBtu/yr. which is equivalent to $75,745/yr. with an SIR of 2.7. The installation breakdown is shown in Table ES-2.

TABLE ES-2

COMBINED CONTROL SUMMARY

INSTALLATION	NO. OF BLDGS.	ENERGY SAVINGS MBTU/YR.	$/YR	CAPITAL COST $	SIR
HOSPITAL POINT	6	2,938.196	6,552	14,511	4.58
HADNOT POINT	74	21,887.406	48,810	165,925	2.98
AIR STATION	13	2,447.371	7,122	26,989	2.68
BEACH AREA	3	627.487	1,826	8,831	2.10
RIFLE RANGE	8	881.979	2,567	12,113	2.15
FRENCH CREEK	6	1,467.057	3,272	17,405	1.91
CAMP JOHNSON	10	1,191.241	3,467	21,949	1.60
COURTHOUSE BAY	2	470.566	1,369	9,363	1.48
CAMP GEIGER	5	189.864	553	4,434	1.26
PARADISE POINT	1	71.189	207	1,814	1.16
TOTAL	128	32,162.356	75,745	283,334	2.72

ES-3 PROJECTS DEVELOPED

The savings opportunities have been grouped into projects based upon similarity of improvements. The project grouping at this installation is as shown in Table ES-3.

TABLE ES-3
ECO PACKAGES

PACKAGE	ENERGY MBTU/YR	SAVINGS $/YR	CAPITAL COST $	SIR
PIPE INSULATION - CAMP GEIGER (PACKAGE 1)	18,335.774	53,357	88,348	8.12
PIPE INSULATION - HOSPITAL POINT	47,366.701	105,621	176.033	8.07
SYPHON JET SUMP PUMPS	0	193,600	187,200	7.80
PIPE INSULATION - HADNOT POINT (PACKAGE 1)	29,133.814	64,942	113,684	7.69
PIPE INSULATION - RIFLE RANGE & BEACH AREA	15,996.439	46,550	85,890	7.29
PIPE INSULATION - CAMP JOHNSON	16,839.867	49,004	103,385	6.37
PIPE INSULATION - HADNOT POINT (PACKAGE 2)	21,655.238	48,291	104,321	6.26
PIPE INSULATION - HADNOT POINT (PACKAGE 3)	19,953.834	44,497	102,959	5.81
PIPE INSULATION - NEW RIVER AIR STATION	15,178.842	44,170	101,880	5.83
PIPE INSULATION - CAMP GEIGER (PACKAGE 2)	9,520.206	27,704	64,906	5.74
PIPE INSULATION - HADNOT POINT (PACKAGE 4)	19,795.461	44,144	103,129	5.76
PIPE INSULATION - FRENCH CREEK, COURTHOUSE BAY & PARADISE POINT	14,547.092	35,099	88,605	5.32
PIPE INSULATION - HADNOT POINT (PACKAGE 5)	13,928.926	31,062	81,978	5.09
PIPE INSULATION - HADNOT POINT (PACKAGE 6)	9,019.979	20,155	91,956	2.94
COMBINED CONTROLS HADNOT POINT	21,887.809	48,810	165,925	3.00
COMBINED CONTROLS ALL EXCEPT HADNOT POINT	10,284.950	26,934	121,037	2.26
TOTAL	283,444.932	883,926	1,781,236	

ES-4 SUMMARY AND CONCLUSIONS

Summary - A total of 650 buildings were surveyed and evaluated for energy and cost savings opportunities. Sketches of the BSDS were prepared and the steam traps were inspected.

Sixteen projects were developed which will conserve 283,445 MBtu/yr. which is equivalent to $690,326/yr. plus $193,600/yr. in maintenance cost savings for a total of $883,926/yr. for a total investment of $1,781,236.

The savings resultings from steam trap repairs as summarized in the Armstrong steam trap report is 209,196 MBtu/yr. which is equivalent $577,312 for a total investment of $164,900. See Table ES-4 for a breakdown by installation.

The total savings from all projects including the replacement of defective traps is 492,641 MBtu/yr. which is equivalent to $1,267,638/yr. plus $193,600/yr in maintenance cost savings for a total of $1,461,238/yr for a total investment of $1,946,136.

Conclusions - The base should proceed with implementation of the projects listed in Table ES-5, subject to the availability of funding.

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TABLE ES-4

REPLACE DEFECTIVE TRAPS SUMMARY

INSTALLATION	ENERGY SAVINGS MBTU/YR.	ENERGY SAVINGS $/YR.	FAILED NO. OF TRAPS	TOTAL TRAPS	COST	SIR
HADNOT POINT	66,966	191,522	361	5,696	36,100	53.8
PARADISE POINT	4,638	12,350	65	255	6,500	19.3
BEACH AREA	3,841	10,220	11	92	1,100	94.3
CAMP JOHNSON	15,378	40,940	87	997	8,700	47.7
CAMP GEIGER	27,051	71,960	135	882	13,500	54.1
FRENCH CREEK	15,500	44,350	47	417	4,700	95.7
AIR STATION	19,307	51,430	161	890	16,100	32.4
COURTHOUSE BAY	13,315	35,400	97	431	9,700	37.0
RIFLE RANGE	22,404	59,620	154	577	15,400	39.3
HOSPITAL POINT	20,796	59,520	268	844	26,800	22.5
TOTAL	209,196	577,312	1,386	11,081	138,600	42.3

TABLE ES-5
PROJECT SUMMARY

PACKAGE	SAVINGS $/YR	CAPITAL COST $	SIR
REPLACE DEFECTIVE TRAPS	577,312	164,900	42.30
PIPE INSULATION - CAMP GEIGER (PACKAGE 1)	53,357	88,348	8.12
PIPE INSULATION - HOSPITAL POINT	105,621	176,033	8.07
SYPHON JET SUMP PUMPS	193,600	187,200	7.80
PIPE INSULATION - HADNOT POINT (PACKAGE 1)	64,968	113,684	7.69
PIPE INSULATION - RIFLE RANGE & BEACH AREA	46,550	85,890	7.29
PIPE INSULATION - CAMP JOHNSON	49,004	103,385	6.37
PIPE INSULATION - HADNOT POINT (PACKAGE 2)	48,291	104,321	6.26
PIPE INSULATION - HADNOT POINT (PACKAGE 3)	44,497	102,959	5.81
PIPE INSULATION - NEW RIVER AIR STATION	44,170	101,880	5.83
PIPE INSULATION - CAMP GEIGER (PACKAGE 2)	27,704	64,906	5.74
PIPE INSULATION - HADNOT POINT (PACKAGE 4)	44,144	103,129	5.76
PIPE INSULATION - FRENCH CREEK, COURTHOUSE BAY & PARADISE POINT	35,099	88,605	5.32
PIPE INSULATION - HADNOT POINT (PACKAGE 5)	31,062	81,978	5.09
PIPE INSULATION - HADNOT POINT (PACKAGE 6)	20,115	91,956	2.94
COMBINED CONTROLS HADNOT POINT	48,810	165,925	3.00
COMBINED CONTROLS ALL EXCEPT HADNOT POINT	26,934	121,037	2.26
TOTAL	1,461,238	1,946,136	

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1.0 INTRODUCTION

1.1 PURPOSE

The prime objective of this study is to identify and quantify the building steam distribution system and steam condensate return system energy losses and to make and support recommendations of corrective measures and capital improvements which will result in energy and monetary savings to the Government. The objectives of this report are to:

1. Develop a systematic plan of projects and actions to reduce energy consumption at Camp Lejeune and Cherry Point.
2. Use and incorporate into this systematic plan all applicable data.
3. Study state-of-the-art methods of energy conservation which are practical and economically feasible.
4. List and prioritize all energy conservation projects investigated.
5. Prepare preliminary programming and planning documents (Form DD 1391) for selected, feasible energy conservation projects.

1.2 SCOPE OF WORK

This project is divided into three segements

Central Steam and Condensate Return Distribution System (CSDS)

1. Evaluate the use of electric sump pumps, or other alternatives, versus the existing steam ejector systems in manholes and steam pits.

2. Steam Trap Survey (see below).

Building Steam Distribution System and Condensate Return System (BSDS)

1. Inspect, identify and list the physical condition of the BSDS and its components that directly contribute to energy losses including pipe sizes and lengths, expansion joints, valves, heat exchangers, missing insulation, insulation type and thickness,

abandoned piping, condensate return system and components and steam leaks.

2. Prepare diagrammatic sketches which include information on the pipe size,insulation type and thickness, estimated length of pipe,valves,steam trap locations and identification numbers and major steam components such as PRV stations and connections to the CSDS.

3. Evaluate building steam energy use for energy effective improvements, modifications and/or alterations including control improvements and additional pipe insulation. Stand alone boiler plant buildings are excluded.

Steam Trap Survey

Inspect each steam trap providing the following information:

1. Survey Date
2. Building Number/Manhole Number/Map Grid Coordinates
3. Trap Identification
4. Trap Function
5. Manufacturer
6. Type and Size
7. Inlet and Outlet Steam Pressure
8. Trap Condition
9. Recommended Corrective Action
10. Trap Installation Date
11. Trap Piping Layouts
12. Comments on General System Condition
13. Faulty Piping Practices and Misapplied Traps.

Also, tag each trap location with an identification tag referenced on the BSDS sketches or CSDS general development map.

1.3 SUBMITTALS

Submittals have been separated into the following components:

1. Special Advance Data Reports
   a. Steam leaks - This report provides the locations of BSDS leaks identified during the field survey.

b. Failed traps - This report provides tag numbers and locations of all CSDS and BSDS traps which were identified as having failed during the field survey.

c. Misapplied, inaccessible or improperly piped traps - This report provides a listing of the traps identified during the field survey to be misapplied, inaccessible or improperly piped with corrective procedures required to correct the installation including an estimate of the material, labor and associated costs for the correction.

2. Trap Report - This report provides the following information on all CSDS and BSDS traps:

   a. Survey date
   b. Building number/manhole number/map grid coordinate
   c. Trap identification number
   d. Trap function
   e. Manufacturer
   f. Type and size of trap
   g. Inlet and outlet steam pressure
   h. Trap condition as determined by ultrasonic testing
   i. Recommended corrective actions
   j. Trap installation date
   k. Faulty piping practices and misapplied steam traps
   l. General comments

   Each trap is located on the diagrammatic sketches described below and has been tagged with an identity tag matching the trap number on the sketches. Floppy disks are also provided which contain all the information provided in the report. The files were prepared for use on an IBM compatible personal computer using dBase III+ which is a database management software package developed by Ashton Tate.

3. Diagrammatic sketches - The sketches are schematic representations of the BSDS.

4. Energy report - This report provides the results of the evaluation of energy effective improvements, modifications and/or alternations to the BSDS with identified energy conservation opportunities, ECIP life cycle analysis sheets, and preliminary 1391's.

1.4 DESCRIPTION OF INSTALLATIONS

The study is further subdivided into three installations as follows:

1. Cherry Point Naval Air Rework Facility (NARF) - This installation consists of 25 buildings served by the steam distribution system.
2. MCAS Cherry Point - This installation consists of 111 buildings served by the steam distribution system and 21 buildings with stand-alone boilers.
3. Camp Lejeune
   a. Beach Area consists of six buildings served by 1200 lineal feet of aboveground steam and condensate distribution lines supplied from the steam plant in Building BA106.
   b. Camp Geiger consists of 147 buildings served by both overhead steam and condensate lines and an underground portion which includes 23 manholes. The system is supplied from the steam plant in Building G-650.
   c. Monford Point (Camp Johnson) consists of 109 buildings served by 16,400 lineal feet of aboveground steam and condensate lines supplied from the steam plant in Building M625 or Building M230.
   d. Courthouse Bay consists of 25 buildings served by both underground and overhead steam and condensate lines consisting of 2000 lineal feet of aboveground lines and an underground portion which includes 10 manholes. The system is supplied from the steam plant in Building BB-9.
   e. Rifle Range consists of 10 buildings served by an

underground steam condensate system which includes 10 manholes supplied from the steam plant in Building RR-15.

f. Paradise Point consists of 17 buildings served by an underground steam and condensate system which includes nine manholes supplied from the steam plant in Building PP-2615.

g. New River Air Station consists of 49 buildings served by both underground and overhead steam and condensate lines consisting of 20,500 lineal feet of aboveground lines and an underground portion which includes 12 manholes. The system is supplied from the steam plant in Building AS4115.

h. Hadnot Point consists of 237 buildings served by both underground and overhead steam and condensate lines consisting of 21,200 lineal feet of aboveground lines and an underground portion which includes 299 manholes. The system is supplied from the steam plant in Building 1700.

i. French Creek consist of 38 buildings served by the Hadnot Point distribution system.

j. Hospital Point consists of 12 buildings served by the Hadnot Point distribution system.

k. There are eight buildings that have their own steam boiler or are served by an adjacent building with a boiler.

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2.0 SOURCES OF DATA

2.1 INTRODUCTION

This section discusses methods of data collection, vendor contacts for equipment sizing and cost information, and copies of related correspondence.

2.2 FIELD TRIPS AND OBSERVATIONS

The Cherry Point Naval Air Rework Facility was surveyed during the period September 8, 1986 thru October 30, 1986. The Marine Corps Air Station at Cherry Point was surveyed during the period November 1, 1986 thru December 17, 1986. The Marine Corps Base was surveyed during the period December 18, 1986 thru April 23, 1987.

A total of 823 buildings were surveyed with installation totals of:

Cherry Point NARF	-	25
MCAS Cherry Point	-	132
Camp Lejeune	-	666

A consolidated list of buildings covered in this report is enclosed in Appendix A.

The field survey was performed in two segments. MAIN inspected the BSDS and its components that directly contribute to energy losses and prepared diagrammatic sketches which included information on the pipe size, insulation type and size, estimated lengths of sized pipe, valve locations, trap identifications numbers, major steam using components locations, PRV stations and CSDS connections.

The steam trap survey and subsequent analysis was performed by the subcontracted firms Energy Efficiency Consultants, Inc. (EEC) or Armstrong, Inc. under the direction of MAIN. The steam traps were examined using an ultrasonic gun. This instrument is manufactured by U.E. Systems, Inc. It has an aluminum alloy probe which measures sound frequency. A final

reading is derived from a calibrated scale in conjunction with a visual indication and an audio signal. From this examination, a determination is made concerning the condition of the trap. Other pertinent information regarding the trap installation such as faulty piping practices, misapplied steam traps, and inaccessible trap locations were noted. Each accessible trap was also tagged with an identity tag with a unique indentification number and a tag was provided for all inaccessible traps.

2.3 DRAWINGS AND BASE RECORDS

Information collected during the building surveys was supplemented by reviewing drawings for many of the buildings. Site plans for the installations were obtained and were used throughout the survey.

2.4 MILITARY AND GOVERNMENT PUBLICATIONS

This report was prepared in accordance with numerous military and government publications. These documents are referenced throughout the report.

2.5 VENDOR CONTACTS AND PERTINENT COMMUNICATIONS

Manufacturers of equipment and supplies have been contacted providing size, cost and operating information for various items of equipment analyzed in the report.

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3.0 ANALYSIS METHODOLOGY

3.1 INTRODUCTION

The following sections discuss:

3.2 Fuel Cost and Plant Efficiency

3.3 General Analysis Methods

3.4 Economic Analysis

3.2 FUEL COSTS AND PLANT EFFICIENCIES

Table 3.2.1, Fuel Cost Summary presents current cost for electricity coal and oil. Cost and efficiencies were provided by NAVFAC-Atlantic.

3.3 GENERAL ANALYSIS METHODS

Introduction -Data Management for this study used an IBM AT and an IDS (IBM compatible) computer. The software package used the lastest version of dBase III + which is a database management software package development by Ashton-Tate. It is commercially available and provides state-of-the-art capabilities and flexibilities in the manipulation of large amounts of data. It has proven reliability, straight forward application, and is widely accepted in the business, industrial and utility communities. The program was used to transfer data from the field survey sheets and sketches into computer files which have subsequently been used in the Energy Conservation Opprotunity (ECO) and Energy Conservation Investment Program (ECIP) analyses.

The calculation methodology for each ECO is presented in Section 4.0. A detailed explanation of this procedure is provided below. The rational for combining various ECOs into DD1391 packages are presented in Section 6.0. The development of the equations used to complete the repetitive calculations involved in the ECO analyses and the resulting tables of supporting information are subsequently presented.

Eco Analysis - Separate methodologies have been developed

TABLE 3.2-1
UTILITY COST SUMMARY

INSTALLATION	STEAM PLANT BLDG. NO.	EFFICIENCY %	FUEL TYPE	UNIT COST $/UNIT	$/MBTU	ELECTRICITY $/KWH	COST $/MBTU	DEMAND CHARGE $/KW
CHERRY POINT								
NARF	-	73	COAL	54.68/TON	2.28	0.03265	9.57	84.48
AIR STATION	-	73	COAL	54.68/TON	2.28	0.03265	9.57	84.48
CAMP LEJEUNE								
BEACH AREA	BA106	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
CAMP GEIGER	G650	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
MONTFORD PT. (CAMP JOHNSON)	M625	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
COURTHOUSE BAY	BB9	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
RIFLE RANGE	RR15	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
PARADISE PT.	PP2615	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
NEW RIVER AIR STATION	AS4151	70.4	#6F.O.	0.442019/gal	2.91	0.02781	8.15	14.81
HADNOT PT.	HP1700	73	COAL	53.42/TON	2.23	0.02781	8.15	14.81
HOSPITAL PT.	HP1700	73	COAL	53.42/TON	2.23	0.02781	8.15	14.81
FRENCH CREEK	HP1700	73	COAL	53.42/TON	2.23	0.02781	8.15	14.81

53.42/ton

13000

for analyzing ECOs using field data collected during the field survey. The basic steps employed in this procedure are discussed below.

Step 1-Field Data Collection - In addition to the information provided on the BSDS diagrammatic sketches, information was gathered on each building or on one building which was determined to be typical of a group of buildings regarding size, number of floors and mechanical systems. This additional information was used primarily for analyzing control system ECOs and consisted of building square footage, wall, window and door areas.

Step 2 - Data Entry Procedures - The data was entered into standard dBase III + database files. Separate computer files were created for each building for the piping insulation analysis and a single file was created for each of the control system ECOs.

Step 3 - Energy Savings Methodology and Cost of Installation - An introduction and description of the existing condition and the ECO to be evaluated is presented in Section 4.0 under the headings "Introduction" and "Existing Condition". For each ECO a method of calculating energy savings is determined. These are industry accepted methods and are shown for each of the ECOs under the heading "Calculation Methodology." An equation is developed that estimates the reduction in energy lost through the building envelope (boundary), given a particular ECO is implemented. An example is then presented under the heading "Calculation Example" illustrating the methodolgy.

For each ECO, the construction costs are developed and are presented under the heading "Cost Estimate". The primary sources for the cost of construction materials and labor are the "1987 Means Mechanical Cost Data Estimating Guide and "EMCS Cost Estimating Guidelines" HNDSP 83-049-ED-ME by the U.S. Army Corps of Engineers - Huntsville Division. The costs include the direct material and labor prices in addition to the following contractor expenses:

Overhead	15%
Profit	10%
Bond	1%

Many of the equations used required parameters that do not vary at the installations. The following values are those used for these standard parameters and were provided by NAVFAC-Atlantic for use in this study:

Structure Type	Indoor Design Temp. (deg.F)	Uwall	Uroof	Uglass	Infiltration cfm/lin.ft.
1. Office	68	0.10	0.09	0.62	0.25
2. Occ.Whse	65	0.39	0.19	1.10	0.50
3. Unocc.Whse/ Hanger	55	0.76	1.28	1.10	0.50
4. Hospital	72	0.10	0.09	0.62	0.20

Outdoor design temp	23 deg. F
Wind velocity	0 mph
Pipe temperature	Design Steam or Condensate Temp.
Heating Season	Nov-April

Step 4 - Application of Methodology to Buildings - The equations developed in Step 3 are programmed into the computer and building parameters required for the specific ECO under analysis are extracted from the dBase files created from the field survey data. Energy savings are calculated for each building surveyed with savings from the typical buildings applied to those buildings determined to be identical.

Step 5 - Determination of Raw Source Energy Savings -

Total energy cost savings is dependent upon the type fuel used to provide steam for the building. Heating efficiencies were provided for use in this study to account for energy losses through the distribution system and the heating plant. Once the boundary energy savings are calculated, it is divided by efficiency for the appropriate fuel type and heating plant to determine the raw source energy savings.

3.4 ECONOMIC ANALYSIS

Introduction - Life cycle cost analysis for energy retrofit construction projects is required by the National Energy Conservation Act of 1978, Public Law 95-619 (NECPA). Analysis is in accordance with the Code of Federal Regulations, Title 10 - Energy, and the Assistant Secretary of Defense for Manpower, Reserve Affairs and Logistics Memorandum 31 August 1982.

The Energy Conservation Investment Program (ECIP) is a military construction funded program which prioritizes energy retrofit construction projects on the basis of greatest life-cycle payback as determined by the Savings-to-Investment Ratio (SIR). The ECIP is implemented in accordance with the objectives of the NECPA and the Department of Defense Management Plan.

The ECIP analyses completed for the ECOs presented in Section 4.0 use the methodology incorporated in Form DD 1391C. The ECIP form has been provided on a floppy disk for use in this report by NAVFAC-Atlantic.

Report Methodology - The total construction cost quantities developed in Step 3 of the ECO Analysis (Section 3.3) are entered in Item 1A of the ECIP form. (See page 3.6)
The Contingency, Supervision, Inspections, and Overhead (SIOH), percentage has been provided on the floppy disk and is 5.5%. The Design Cost has also been provided which is 6.0%. The project year has been established to be FY88.

Fuel costs ($/MBtu), presented in item 2-1A-F, are those listed in Section 3.2 of this report.

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HADNOT POINT	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	593,422
B. SIOH		32,638
C. DESIGN COST		35,605
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		595,499
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	595,499

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	112,416	250,687	13.5	3,384,272
F. TOTAL	$	112,416	250,687		3,384,272

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1,116,810
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 250,709

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,384,475

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.7

Energy cost savings by fuel type (MBtu/yr), described in Step 5 of Section 3.3, are entered to the ECIP form in items 2-2A-F.

Uniform Present Worth Factors (UPW) for discounting energy and nonenergy savings are as provided on the floppy disk. The UPW factors are based on a 7% discount rate. The energy discount factors include the DOE projected escalation rate in energy prices developed from the Energy Information (EIA) projected real average fuel price index.

<u>Results</u> - Results for the individual ECO life cycle cost analysis are presented in Section 4.0 with each ECO analysis.

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4.0 STUDIES OF ECO FEASIBILITIES

4.1 INTRODUCTION

This Section contains the analyses of the energy conservation opportunities (ECOs)

General Analysis Methods

See Section 3.3, "General Analysis Methods" for a detailed explanation of the ECO analysis procedure contained herein. See Section 3.4, "Economic Analysis" for an explanation of the ECIP forms.

4.2 REPLACE STEAM MANHOLE EJECTORS (CSDS)

Introduction - This ECO discusses energy and cost savings which would be realized by replacing the existing manhole and steam pit ejector systems. (Note: This Section is indentical to that in the Naval Air Repair Facility (NARF) report because one maintenance area is responsible for all Cherry Point steam ejectors. Therefore, savings and costs should only be used from one of the two reports.)

Existing Condition - Storm water which has collected in existing manholes or steam pits is currently being ejected from sumps in the manholes either to grade or to a sanitary collection system through use of automatic steam ejectors. A model 2R (See Appendix B) by Penberthy is being used which has been discontinued. Parts are available on a special order basis only which has compounded the maintenance cost for these units. The ejectors have historically been a high maintenance item, so additional spare parts costs and unavailability of these parts has made continued use of these ejectors prohibitive. An automatic sump drainer (See Appendix C) has been provided by Penberthy as a replacement but it has proven to be structurally unsound in this application.

Several alternative are available to replace the Penberthy ejectors:

1. Electric sump pumps
2. Water ejectors
3. Syphon jet pumps

The analysis of each is as follows:

Electric Sump Pumps: Electric sump pumps may be installed either in the manhole or outside the manhole. The installation outside the manhole consists of either a horizontal self priming centrifugal pump located on top of the manhole or on a nearby pad or a vertical pump mounted on the manhole lid with the impeller in the manhole sump. This arrangement has been eliminated because of the high cost of these pumps ($2000+) and the high installation costs. The installation in the manhole consists of a submersible sump pump

located in the existing sump and connected to the existing discharge line. The main addition required besides the pump is a source of 110 volt power requiring a buried electrical cable from a power source to each sump pump.

Water Ejectors: The existing Penberthy steam ejectors could also be operated with water under pressure providing the motive force to perform the vacuum pumping operation instead of steam. This alternative has been eliminated because there would have to be a water supply run to each manhole and a new pumping system in some cases. The only water source available is treated water and since this treated water would be discharged with the storm water being pumped, there would be a large additional operating expense. Failure of the existing steam ejectors is detectable because of the characteristics of steam being quite visible when leaking. A water powered ejector failure would not be detected until the manhole is flooded. Also the problem with the Penberthy steam ejector spare parts availability would not be solved.

Syphon Jet Pump: This arrangement consists of a thermodynamic trap and a steam syphon. The assembly called a jet pump (See Appendix D) would be installed in a parallel position in the sump at the desired liquid level. The steam piping to the jet pump and the discharge piping would be the same as what is currently in place. As the water level rises in the sump, it covers the thermodynamic steam trap causing the trap to open similar to the normal operation of the trap. Inlet pressure steam is discharged from the trap through the syphon creating a high velocity syphon suction in the sump. The water level will drop until the trap is uncovered, which wil shut the trap and stop the syphon. The jet pump will cycle as liquid enters the sump. Advantages of this system is that there is only one moving part (steam trap disc) which is easily repaired in place, the trap and syphon are readily available at a reasonable price, and the unit also operates as a main drip preventing the backing up of condensate in the existing system when no storm water is present.

Calculation Methodology - Following is the methodology

used to calculate energy savings from replacement of existing steam manhole ejectors.

Electric Sump Pumps:

Energy Savings = Steam Ejector energy usage - Electric Sump Pump energy usage

Where: Energy savings = MBtu/yr

Electric sump pump energy usage = (see below)

Steam ejector energy usage = (see below)

Electric Sump Pump Energy Usage = Sump Pump Operating Hours x HP x 0.746 kw/hp x 3412 Btu/kw-hr

Where: Sump Pump operating hours = (see below)

HP = motor nameplate horsepower

Sump Pump operating hours = A x R x 1 ft/12 in x 1/pump cap. x 1 hr/60 min x 7.48 gal/cubic ft.

Where: A = Manhole surface area, sq. ft (use 95 per installation manhole drawings)

R = Average rainfall, in./yr (Use 54 per National Climatic Data Center - average for 1945 - 1977)

Therefore Sump Pump operating hours = 95 x 54 x 1/12 x 1/20 x 1/60 x 7.48

= 2.66 hrs/yr

Electric Sump Pump Energy Usage = 2.66 x 0.5 x 0.746 x 3412

= 3,395 Btu/yr

Steam Ejector Energy Usage = Ejector operating hours x Steam usage/hr. x 1/Plant Eff.

Where: Ejector operating hours (see below)

Steam Usage/hr = 109.5 lb x 100 Btu/lb

= 109,500 Btu/hr per Perberthy model 2R-SL specifications (see Appendix B)

Plant Eff. = Efficiency of the steam generating plant (See Section 3.2 "Fuel Costs and Efficiencies)

Ejector Operating Hours = A x R x 1 ft./12 in. x
1/Ejector Cap x 1 hr/60 min x
7.48 gal/cubic ft.

Where: A = 95 (see above)
R = 54 (see above)
Ejector Cap = 18 gpm (per installation manhole drawings)

Therefore Steam Ejector Operating Hours = 95 x 54 x 1/12
x 1/18 x 1/60 x
7.48
= 2.96 hrs/yr.

Steam Ejector Energy Usage = 2.96 x 109,500 Btu/hr x 1/0.73
= 444,000 Btu/yr.

Energy Savings = (444,000 - 3385) x 1 MBtu/1x106 Btu
= 0.44 MBtu/yr

Syphon Jet Pumps - Both syphon jet pumps and the existing ejectors use steam as the motive force and would each have a steam usage essentially the same. Therefore, no energy savings would be realized with this alternative.

To complete the analysis, maintenance costs must be evaluated. Maintenance costs are as follows:

Electric Sump Pumps

Maintenance Cost = Sump pump operating hours x Maintenance cost/yr.

Where: Sump pump operating hours = 2.66/yr.
Maintenance cost/yr = $100/10 hr. run time (per manufacturer's rep.)
Maintenance Cost = 2.66 hrs. x $100/10hrs
= $26.60/yr

Syphon Jet Pumps - Maintenance would be minimal with this alternative amounting to a trap repair every other year.

Maintenance Cost = $50/yr.

Existing Steam Ejectors

Reference: Actual maintenance records

Maintenance Cost = [(150 rebuilds/year x $825/rebuild)
+ (1200 repairs/year x $75/repair)]
= $213.750/400 steam ejectors
= $534/steam ejector-yr.

Cost Estimate - The items required to replace the existing steam ejectors are as follows:

Electric Sump Pumps

Item	Materials	Labor	Total
Submersible Sump Pump	$ 590	$ 100	$ 690
Wiring & Conduit (100 ft.)	38	79	117

TOTAL $807/steam ejector

Syphon Jet Pumps

Item	Materials	Labor	Total
Thermostatic Trap and Steam Syphon	$ 436	$ 32	$ 468

TOTAL $599/steam ejector

Summary - The life-cycle cost analysis of the electric sump pump alternative indicates that a discounted savings to investment ratio (SIR) of 4.5 and cost savings of $476/yr could be realized with a construction cost of $807/steam ejector. This electric operating cost includes a demand charge of $84.68 per kw or $31.50 per sump pump.

The life-cycle cost analysis of the syphon jet alternative indicates that a discounted savings to investment ratio (SIR) of 7.8 and cost savings $484 yr. could be realized with a construction cost of $468/steam ejector.

These ECOs do not qualify for funding under the ECIP program because the non-energy savings exceed the percentage allowed for this category by the program. However, the syphon jet alternative is very attractive with an SIR of 7.8 and a simple payback of 1.0 year in comparison to an SIR of 4.5 and a simple payback of 1.7

years for the electric sump pump.

There are approximately 400 steam ejectors at Camp Lejeune. The total cost of installation for all manholes for the syphon jet pumps would be $187,200 with a cost savings of $193,600/year.

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	ELECTRIC SUMP PUMPS	FISCAL YEAR:	1988
PORTION NAME:	STEAM MANHOLES		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	807
B. SIOH		44
C. DESIGN COST		48
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		810
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	810

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	0	1	10.18	13
F. TOTAL	$	0	1		13

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	476
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	3,620

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 3,620

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 4
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F ERR
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 477

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,633

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 4.5

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	SYPHON JET SUMP PUMPS	FISCAL YEAR:	1988
PORTION NAME:	STEAM MANHOLES		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	468
B. SIOH		26
C. DESIGN COST		28
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		470
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	470

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	0	0	0	0
F. TOTAL	$	0	0		0

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	484
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	3,681

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 3,681

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 0
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F ERR
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 484

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,681

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.8

4.3 UPGRADE PIPE INSULATION - (BSDS)

Introduction - This ECO discusses energy and cost savings which would be realized by upgrading pipe insulation on BSDS steam and condensate lines in many buildings at this installation.

Existing Condition - Heat losses from uninsulated or minimally insulated steam and condensate lines can be substantial. This loss of heat must continuously be offset by the addition of heat to maintain the steam or hot water system at its operating temperature. This heat loss occurs 24 hours per day during the months that the lines are in service. The magnitude of these losses depends on the temperature differential between the piping system and surroundings, on pipe size, quantity of existing insulation, type of existing insulation, and hours per year of service.

All uninsulated or minimally insulated sections of pipe can be insulated or upgraded to an appropriate optimum thickness by using preformed pipe insulation with jacket manufactured for the correct outside diameter of the line to be insulated.

Calculation Methodology

Energy Savings = (Existing heat loss - Optimum heat loss) x Hours/yr. x

1, 10^6

1MBtu/1x106 Btu

Where: Energy Savings = Rate of heat transfer from pipe and insulation system MBtu/yr.

Optimum heat loss = Heat loss with insulation thickness as recommended by ASHRAE Std. 90A-1980 (Appendix E) see below for equation), Btu/hr

Existing heat loss = Heat loss from existing insulation or bare pipe system (see below), Btu/hr

Reference: 1981 ASHRAE Fundamentals

Optimum Heat Loss=

$$\frac{To - Ta}{Ds[\ln(D1/Do)]/2K1 + Ds\ [\ln\ (Ds/D1)]\ /\ 2K2 + Rs} \text{ X}$$

L x (3.14 x Ds /12) x (1MBtu/1x106Btu) x (1/Plant Eff.)

Where To = Temperature of inner surface of insulation, deg. F

= 259 deg. F for steam @ 15-20 psig BSDS pressure

= 212 deg. F for condensate

Ta = Temperature of ambient air, deg. F

= 70 deg. F for occupied space

= 60 deg. F for crawl spaces or attics based upon 70 deg. F space temperature and 48.7 deg. F average winter temperature (AWT)

Ds = Outer diameter of insulation, in.

D1 = Outer diameter of intermediate layer of insulation, in.

Do = Outside diameter of pipe or existing insulation, in.

k = Thermal conductivity of insulation at mean temperature, Btu-in/h-sq. ft.-deg. F
Reference: 1981 ASHRAE Fundamentals

Insulation Type	K
Fiberglass	0.36
85% Magnesia	0.37
Calcium Silicate	0.40
Mineral Wool	0.27
Asbestos	0.62

Rs = Surface resistance, sq. ft. - deg. F - h/Btu
Use 0.71 (wind velocity = 0 mph)

L = Length of line

Plant Eff = Efficiency of the steam generating plant (See Section 3.2 "Fuel Costs and Efficiencies")

ln = Natural or Naperian logarithm

Existing Heat Loss

= Same equation as optimum heat loss (for lines with existing insulation)

= (see table below for bare pipes)

Reference: 1981 ASHRAE Fundamentals (based on Mellon Institute tests)

Nominal Pipe	Heat Loss Btu/hr	
Diameter, in	Steam	Condensate
0.5	3.03	2.75
0.75	2.97	2.69
1.0	2.92	2.64
1.25	2.87	2.59
1.5	2.84	2.56
2.0	2.79	2.51
2.5	2.75	2.47
3.0	2.71	2.42
3.5	2.68	2.40
4.0	2.66	2.38
5.0	2.62	2.36
6.0	2.59	2.33
8.0	2.54	2.29
10.0	2.51	2.26
12.0	2.48	2.23
14.0	2.47	2.22
16.0	2.45	2.20
18.0	2.43	2.18
20.0	2.41	2.17
22.0	2.40	2.16
24.0	2.39	2.15

Calculation Example:

Given: 1. Steam service, To = 259 deg. F

2. Ta = 70 deg. F

3. Ds = 5.5" (nominal 4" pipe with 1/2" existing insulation)

4. Do = 4.5" (nominal 4" pipe)

5. k = 0.36 (fiberglass insulation)

6. L = 100 ft.

7. Plant Eff. = 0.73

8. Optimum insulation thickness = 2 1/2"

9. Hours = 4380/yr

Existing Heat Loss =

$$\frac{259-70}{5.5 \ln (5.5/4.5)/(2x0.36)+0.71}$$

= 84.27 Btu/hr. sq.ft.

Optimum Heat Loss =

$$\frac{259-70}{9.5 \ln (5.5/4.5)/(2x\ 0.36) + 9.5 \ln (9.5/5.5)/(2x0.36)+ 0.71}$$

= 17.88 Btu / hr. - sq.ft.

Energy Savings = (84.27 - 17.88) x 4380 x 1MBtu/1x106 Btu

= 0.29 MBtu/yr.

Cost Estimate - The costs to add insulation to an existing line or to add additional insulation to a line with an insufficient amount of insulation is as tabulated in Appendix F.

Summary - The following pages present ECIP sheets at each installation for buildings with SIRs greater than 1.0. See Appendix G for the individual building energy savings for all buildings. See Appendix H for the pipe insulation material takeoffs for each building.

The results of the life cycle cost analysis are listed below:

INSTALLATION	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITAL COST $	SIR
Beach Area	3,938.427	11,461	18,944	8.1
Hospital Point	47,366.701	105,628	176,033	8.1
Courthouse Bay	7,817.901	22,750	42,770	7.2
Camp Geiger	27,855.980	81,061	153,254	7.1
Rifle Range	12,104.915	35,225	67,224	7.1
Camp Johnson	16,839.867	49,004	103,385	6.4
Air Station	15,178.842	44,170	101,880	5.8
Hadnot Point	113,487.252	253,077	598,027	5.7
Paradise Point	3,910.616	11,380	27,100	5.7
French Creek	2,818.575	6,285	18,735	4.5

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: BEACH AREA
PROJECT TITLE: PIPE INSULATION
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988

ECONOMIC LIFE IN YEARS: 25
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	18,944
B. SIOH		1,042
C. DESIGN COST		1,137
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		19,010
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	19,010

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	3,938	11,461	13.5	154,721
F. TOTAL	$	3,938	11,461		154,721

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 51,058
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 11,483

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 154,924

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 8.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HOSPITAL POINT	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	176,033
B. SIOH		9,682
C. DESIGN COST		10,562
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		176,649
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	176,649

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	47,367	105,628	13.5	1,425,975
F. TOTAL	$	47,367	105,628		1,425,975

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 470,572
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 105,650

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,426,177

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 8.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	COURTHOUSE BAY	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	42,770
B. SIOH		2,352
C. DESIGN COST		2,566
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		42,920
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	42,920

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	7,818	22,750	13.5	307,126
F. TOTAL	$	7,818	22,750		307,126

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 101,352
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 22,772

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 307,329

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.2

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP GEIGER	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	153,254
B. SIOH		8,429
C. DESIGN COST		9,195
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		153,790
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	153,790

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	27,856	81,061	13.5	1,094,322
F. TOTAL	$	27,856	81,061		1,094,322

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 361,126

a. IF 3D1 IS = > 3C GO TO ITEM 4

b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0

c. IF 3D1b IS = > 1 GO TO ITEM 4

d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 81,083

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,094,525

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	RIFLE RANGE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	67,224
B. SIOH		3,697
C. DESIGN COST		4,033
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		67,459
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	67,459

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	12,105	35,225	13.5	475,542
F. TOTAL	$	12,105	35,225		475,542

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 156,929
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 35,248

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 475,744

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP JOHNSON	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	103,385
B. SIOH		5,686
C. DESIGN COST		6,203
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		103,747
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	103,747

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	16,840	49,004	13.5	661,554
F. TOTAL	$	16,840	49,004		661,554

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 218,313
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 49,026

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 661,757

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 6.4

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	NEW RIVER AIR STATION	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	101,880
B. SIOH		5,603
C. DESIGN COST		6,113
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		102,237
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	102,237

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	15,179	44,170	13.5	596,301
F. TOTAL	$	15,179	44,170		596,301

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 196,779
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 44,193

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 596,504

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HADNOT POINT	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	598,027
B. SIOH		32,891
C. DESIGN COST		35,882
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		600,120
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	600,120

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	113,487	253,077	13.5	3,416,534
F. TOTAL	$	113,487	253,077		3,416,534

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1,127,456
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 253,099

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,416,737

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	PARADISE POINT	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	27,100
B. SIOH		1,491
C. DESIGN COST		1,626
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		27,195
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	27,195

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	3,911	11,380	13.5	153,629
F. TOTAL	$	3,911	11,380		153,629

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 50,697
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 11,402

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 153,831

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	FRENCH CREEK	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	18,735
B. SIOH		1,030
C. DESIGN COST		1,124
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		18,801
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	18,801

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	2,819	6,285	13.5	84,853
F. TOTAL	$	2,819	6,285		84,853

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 28,002
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 6,308

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 85,056

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 4.5

4.4 NIGHT SETBACK

Introduction - This ECO discusses energy and cost savings which would be realized by installing night setback temperature controls in many buildings at this installation. These controls would be stand-alone controls that are compatible with the existing Energy Management Control System (EMCS) which is controlled by a Hewlett Packard (HP) 1000 computer.

Existing Condition - Many buildings at this installation are heated to maintain a constant temperature regardless of whether they are occupied or not.

Substantial amounts of energy can be saved by maintaining a lower space temperature during unoccupied hours. This applies only to facilities that do not operate 24 hours per day. This can be accomplished by sending a signal from the a time clock to a new steam shutoff valve to close during unoccupied hours and to open prior to morning startup to bring the building back up to temperature. A new space temperature sensor would be installed in a north perimeter zone in the buildings to override the time clock to avoid the possibilty of pipe freezing. The standard setback amount to be used is 10 degrees F.

Calculation Methodology - Following is the methodology used to calculate energy savings from night setback of building steam or hot water systems.

Reference: CR82.030 "Standardized EMCS Energy Savings Calculations." pg. 50

Energy Savings =

$$\frac{BTT \times AZ \times SD \times (168\text{-}H) \times WKW}{HEFF} \times \frac{1\ MBtu}{1x106BTu} \times \frac{1}{\text{Plant Eff.}}$$

Where:

Enery Savings = Rate of heat transfer from the building boundary in MBtu/yr

AZ = Area of zone being served in sq. ft.

BTT = Building thermal transmission in Btu/hr. deg. F. sq. ft. (see below)

H = Hours of operation per week during which the normal setpoint applies.

HEFF = Heating efficiency of the distribution system and heating equipment (use 0.90 per REFERENCE).

SD = Thermostat setback for unoccupied periods during the heating season in deg. F. (use 10)

WKW = Length of winter heating season in weeks per year (see below)

Plant Eff. = Efficiency of the steam generating plant (See Section 3.2 "Fuel Costs and Efficiencies")

BTT = (Uo x AW)+(Ix1.08 Btu/cfm-deg. F - hr))/AF

Where: AW = Total Area of exterior surfaces in sq. ft.

AF = Total floor area of the building in sq. ft.

Uo = Combined U-factor for all exterior surfaces (wall, windows, doors, roof) in Btu/sq. ft.-hr. deg. F.

I = Total infiltration for building in cfm

$$Uo = \frac{Uwall\ Awall + Uwindow\ Awindow + Udoor\ Adoor + Uroof\ Aroof}{AW}$$

Where: Uwall, window, roof = Values in Section 3.3 "General Analysis Methods."

Udoor = 0.3

AW = Total area of exterior surfaces in sq. ft.

$$WKW = \frac{\text{Total annual hours/yr below 55 deg. F}}{\text{24 hrs/day x 7 days week}}$$

Reference: NAVFAC P-89 <u>Engineering Weather Data</u>

Temp. Range deg.F	Annual Total Hours
50/54	684
45/49	636
40/44	578
35/39	425
30/34	302
25/29	152
20/24	51
15/19	14
10/14	2
Total	2844 hr./yr.

$$WKW = \frac{2844 \text{ hr./yr.}}{24\text{hr/day} \times 7 \text{ day/wk.}}$$

= 16.9 wks./yr.

Calculation Example:

Given:
1. Structure Type = Office
2. Awall = 10,000 sq. ft.
3. Awindow = 500 sq. ft.
4. Adoor = 500 sq. ft.
5. Aroof = 3000 sq. ft.
6. Crack = 200 lin. ft.
7. Hours = 40/week
8. Plant Eff. = 0.73

AW = 10,000 + 500 + 500 + 3000 = 14,000 sq ft.

I = 200 lin. ft. x 0.25 cfm/lin. ft. = 50 cfm

$$Uo = \frac{(0.1\times10{,}000)+(0.62\times500)+(0.3\times500)+(0.09\times3000)}{14000}$$

= 0.124 Btu/sq. ft.- hr-deg. F

BTT = [(0.124x14,000)+(50x1.08)]/3000

= 0.597 Btu/sq. ft. - hr-deg. F

Energy Savings =

$$\frac{0.597 \times 3000 \times 10 \times (168-40) \times 16.9}{0.90} \times 1\ \text{MBtu}/1 \times 10^6\ \text{Btu} \times 1/0.73$$

= 58.97 MBtu/yr

Cost Estimate - The items and associated costs required to accomplish night setback are as follows:

Hot Water Heat (Steam/HW Converter)

Item	Materials	Labor	Total
Space temperature sensor	119	17	136
Outside air temperature sensor	119	17	136
Time clock (digital)	470	35	505
Motorized steam valve	414	92	506
Pneumatic valve controller	204	44	248
EP transducer	239	44	283

Total Cost = $1814/building

Steam Heat (AHU, radiator, or steam unit heater)

Same as for Hot Water Heat plus the following cost per air handling unit:

Item	Materials	Labor	Total
Control relay-start/stop	25	44	69
Pneumatic damper actuator	133	30	163
Control relay-damper	25	44	69
EP valve	72	30	102

Total = $1814/building + $403/air handling unit

Summary - The following pages present individual building energy savings and cost estimates for all buildings at each installation, and the ECIP sheets for all night setback ECOs with an SIR greater than 1.0.

The results of the life-cycle analysis are listed below:

INSTALLATION	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST $	SIR
Hospital Point	1,829.814	4,080	5,442	2.06
Air Station	219.512	638	1,814	4.04
Hadnot Point	16,830.220	37,531	103,798	3.67
French Creek	1,027.128	2,290	11,286	2.06
Beach Area	312.322	908	5,240	1.76
Rifle Range	245.997	715	4,434	1.64
Courthouse Bay	270.440	786	5,442	1.47
Camp Johnson	788.140	2,293	19,147	1.22
Camp Geiger	199.335	580	5,442	1.08
Paradise Point	0.000	0	0	0

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: HOSPITAL POINT
PROJECT TITLE: NIGHT SETBACK
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988

ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	5,442
B. SIOH		299
C. DESIGN COST		327
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		5,461
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	5,461

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	1,830	4,080	10.18	41,539
F. TOTAL	$	1,830	4,080		41,539

3. NON ENERGY SAVINGS (+) / COST (-)
A. ANNUAL RECURRING (+/-) $ 0
(1) DISCOUNT FACTOR (TABLE 1) 7.61
(2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 13,708
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 4,080

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 41,539

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.6

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	NEW RIVER AIR STATION	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	19,752
B. SIOH		1,086
C. DESIGN COST		1,185
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		19,821
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	19,821

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	1,734	5,047	10.18	51,379
F. TOTAL	$	1,734	5,047		51,379

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 16,955
a. IF 3D1 IS = > 3C GO TO ITEM 4 0
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 5,047

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 51,379

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.6

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HADNOT POINT	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	103,798
B. SIOH		5,709
C. DESIGN COST		6,228
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		104,161
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	104,161

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	16,830	37,531	10.18	382,070
F. TOTAL	$	16,830	37,531		382,070

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 126,083
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 37,531

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 382,070

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 3.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FRENCH CREEK
PROJECT TITLE: NIGHT SETBACK
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988

ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST
   A. CONSTRUCTION COST $ 11,286
   B. SIOH 621
   C. DESIGN COST 677
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 11,326
   E. SALVAGE VALUE OF EXISTING EQUIPMENT 0
   F. TOTAL INVESTMENT (1D-1E) $ 11,326

2. ENERGY SAVINGS (+) / (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	1,027	2,290	10.18	23,317
F. TOTAL	$	1,027	2,290		23,317

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) 7.61
      (2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
   B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 7,695
      a. IF 3D1 IS = > 3C GO TO ITEM 4 0
      b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F
      c. IF 3D1b IS = > 1 GO TO ITEM 4
      d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 2,290

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 23,317

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	BEACH AREA	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	5,240
B. SIOH		288
C. DESIGN COST		314
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		5,258
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	5,258

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	312	909	10.18	9,252
F. TOTAL	$	312	909		9,252

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 3,053
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 909

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 9,252

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	RIFLE RANGE	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	4,434
B. SIOH		244
C. DESIGN COST		266
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		4,450
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	4,450

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	246	716	10.18	7,287
F. TOTAL	$	246	716		7,287

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 2,405
a. IF 3D1 IS => 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS => 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 716

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 7,287

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.6

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	COURTHOUSE BAY	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	5,442
B. SIOH		299
C. DESIGN COST		327
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		5,461
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	5,461

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	270	787	10.18	8,011
F. TOTAL	$	270	787		8,011

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 2,644
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 787

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 8,011

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.5

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP JOHNSON	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	19,147
B. SIOH		1,053
C. DESIGN COST		1,149
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		19,214
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	19,214

2. ENERGY SAVINGS (+) / (-)

ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	788	2,293	10.18	23,348
F. TOTAL	$	788	2,293		23,348

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 7,705

a. IF 3D1 IS = > 3C GO TO ITEM 4

b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0

c. IF 3D1b IS = > 1 GO TO ITEM 4

d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 2,293

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 23,348

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.2

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP GEIGER	PROJECT NO.	
PROJECT TITLE:	NIGHT SETBACK	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	5,442
B. SIOH		299
C. DESIGN COST		327
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		5,461
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	5,461

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	199	580	10.18	5,905
F. TOTAL	$	199	580		5,905

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1,949
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 580

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 5,905

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.1

HOSPITAL POINT

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
H14	OFFICE	0.000	0	1,814	0.00
H15A	OFFICE	1,554.782	3,467	1,814	19.38
H16	OFFICE	0.000	0	1,814	0.00
H17	OCC. WAREHOUSE	137.516	306	1,814	1.71
H17N	OCC. WAREHOUSE	137.516	306	1,814	1.71
H18	OCC. WAREHOUSE	70.422	157	1,814	0.87
H19	OCC. WAREHOUSE	74.772	166	1,814	0.93
H21	OFFICE	76.150	169	1,814	0.94
H23	OFFICE	0.000	0	1,814	0.00
H24	OFFICE	0.000	0	1,814	0.00
H36	OCC. WAREHOUSE	54.789	122	1,814	0.68
H39	OFFICE	10.407	23	1,814	0.12

DATE: 06/22/87

SHEET 1 OF 1

AIR STATION

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
AS114	OFFICE	32.336	94	1,814	0.59
AS118	OCC. WAREHOUSE	102.814	299	2,217	1.55
AS122	OFFICE	64.569	187	2,217	0.97
AS124	OCC. WAREHOUSE	71.207	207	1,814	1.31
AS130	OFFICE	64.614	188	2,217	0.97
AS202	OFFICE	69.405	201	3,023	0.76
AS205	OFFICE	36.786	107	3,829	0.32
AS208	OFFICE	38.425	111	1,814	0.70
AS215	OFFICE	217.607	633	1,814	4.01
AS216	OFFICE	217.607	633	1,814	4.01
AS217	OFFICE	217.607	633	2,620	2.77
AS232	OFFICE	50.219	146	2,620	0.64
AS236	OFFICE	38.129	110	1,814	0.70
AS302	OFFICE	45.259	131	2,217	0.68
AS312	OFFICE	51.754	150	1,814	0.95
AS320	OFFICE	57.198	166	1,814	1.05
AS414	OFFICE	33.532	97	1,814	0.61
AS424	OCC. WAREHOUSE	305.526	889	2,217	4.60
AS425	OFFICE	22.199	64	1,814	0.40
AS502	OFFICE	0.000	0	1,814	0.00
AS4012	OFFICE	53.702	156	1,814	0.98
AS4030	OFFICE	0.000	0	1,814	0.00
AS4035	OFFICE	0.000	0	1,814	0.00
AS4110	OCC. WAREHOUSE	243.531	708	1,814	4.48
AS4120	OFFICE	40.332	117	3,023	0.44
AS4122	OFFICE	25.309	73	2,217	0.38
AS4141	OCC. WAREHOUSE	51.816	150	2,217	0.78
AS4145	OFFICE	18.897	54	2,217	0.28
AS4146	OCC. WAREHOUSE	81.790	238	1,814	1.50
AS4157	OFFICE	37.153	108	1,814	0.68
AS4158	OCC. WAREHOUSE	219.512	638	1,814	4.04

DATE: 06/23/87

SHEET 1 OF 1

HADNOT POINT

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1	OFFICE	100.904	225	1,814	1.25
2	OFFICE	59.015	131	1,814	0.73
4	OFFICE	17.487	38	2,217	0.17
6	OFFICE	0.000	0	5,844	0.00
8	OFFICE	138.598	309	5,844	0.53
11	OCC. WAREHOUSE	40.053	89	4,232	0.21
13	OFFICE	27.688	61	1,814	0.34
14	OFFICE	60.674	135	1,814	0.75
15	OFFICE	126.321	281	1,814	1.57
16	OFFICE	32.995	73	1,814	0.41
17	OFFICE	32.020	71	1,814	0.39
18	OFFICE	0.000	0	1,814	0.00
25	OFFICE	31.282	69	1,814	0.39
27	OFFICE	15.781	35	1,814	0.19
41	OFFICE	31.221	69	1,814	0.38
43	OFFICE	12.538	27	1,814	0.15
50	OFFICE	27.688	61	1,814	0.34
54	OFFICE	114.447	255	2,620	0.98
58	OFFICE	110.207	245	3,023	0.82
59	OFFICE	99.842	222	2,620	0.86
63	OFFICE	79.723	177	4,232	0.42
65	OFFICE	104.909	233	5,441	0.43
66	OFFICE	87.558	195	1,814	1.09
67	OFFICE	0.000	0	1,814	0.00
84	OFFICE	214.298	477	2,217	2.18
102	OFFICE	138.598	309	5,441	0.57
106	OFFICE	86.740	193	2,217	0.88
107	OCC. WAREHOUSE	218.481	487	2,217	2.22
114	OFFICE	27.688	61	1,814	0.34
115	OFFICE	42.248	94	2,217	0.43
117	OCC. WAREHOUSE	42.156	94	1,814	0.52
119	OFFICE	21.255	47	1,814	0.26
123	OFFICE	42.472	94	1,814	0.52
127	OFFICE	27.688	61	1,814	0.34
201	OFFICE	42.248	94	2,217	0.43
203	OFFICE	15.738	35	1,814	0.19
206	OCC. WAREHOUSE	218.481	487	2,217	2.22
214	OFFICE	27.688	61	1,814	0.34
216	OFFICE	27.688	61	1,814	0.34
219	OFFICE	27.688	61	1,814	0.34
221	OFFICE	20.736	46	1,814	0.25
223	OFFICE	28.104	62	1,814	0.35
226	OCC. WAREHOUSE	218.481	487	2,217	2.22
233	OFFICE	15.781	35	1,814	0.19
300	OFFICE	32.077	71	2,217	0.32
302	OFFICE	17.924	39	1,814	0.22

DATE: 06/23/87

SHEET 1 OF 4

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
304	OFFICE	27.688	61	1,814	0.34
307	OCC. WAREHOUSE	218.481	487	2,217	2.22
314	OFFICE	86.753	193	2,217	0.88
315	OFFICE	27.688	61	1,814	0.34
317	OFFICE	27.688	61	1,814	0.34
320	OFFICE	25.837	57	1,814	0.32
400	OFFICE	27.688	61	1,814	0.34
401	OFFICE	42.248	94	2,217	0.43
403	OFFICE	15.738	35	1,814	0.19
408	OFFICE	0.000	0	2,217	0.00
412	OFFICE	0.000	0	1,814	0.00
416	OFFICE	23.077	51	1,814	0.28
417	OFFICE	138.598	309	5,844	0.53
419	OFFICE	27.688	61	1,814	0.34
420	OFFICE	0.000	0	1,814	0.00
422	OFFICE	0.000	0	5,844	0.00
423	OFFICE	28.104	62	1,814	0.35
424	OCC. WAREHOUSE	218.481	487	2,217	2.22
500	OCC. WAREHOUSE	123.212	274	2,217	1.25
501	OFFICE	27.688	61	1,814	0.34
502	OFFICE	0.000	0	5,844	0.00
508	OFFICE	76.173	169	1,814	0.94
509	OCC. WAREHOUSE	218.481	487	2,217	2.22
516	OFFICE	29.515	65	1,814	0.36
518	OFFICE	17.924	39	1,814	0.22
520	OFFICE	20.736	46	1,814	0.25
526	OFFICE	29.515	65	1,814	0.36
751	OFFICE	120.495	268	3,426	0.79
898	OFFICE	0.000	0	1,814	0.00
900	OFFICE	128.581	286	1,814	1.60
901	OCC. WAREHOUSE	644.504	1,437	3,426	4.25
902	OCC. WAREHOUSE	569.090	1,269	2,217	5.80
904	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
905	OFFICE	282.505	629	1,814	3.52
907	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
908	OCC. WAREHOUSE	152.766	340	3,023	1.14
909	OCC. WAREHOUSE	444.268	990	1,814	5.54
910	OCC. WAREHOUSE	62.062	138	1,814	0.77
914	OFFICE	282.505	629	1,814	3.52
915	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
916	OCC. WAREHOUSE	531.007	1,184	1,814	6.62
1002	OFFICE	5.674	12	1,814	0.07
1004	UNOCC. WAREHOUSE	55.052	122	1,814	0.68
1005	OFFICE	113.743	253	1,814	1.41
1006	OFFICE	27.849	62	2,217	0.28
1011	OCC. WAREHOUSE	626.192	1,396	2,217	6.38

DATE: 06/23/87

SHEET 2 OF 4

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1012	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
1015	OCC. WAREHOUSE	95.946	213	1,814	1.19
1041	OFFICE	200.083	446	5,038	0.89
1100	OFFICE	14.192	31	1,814	0.17
1101	OCC. WAREHOUSE	278.818	621	6,650	0.94
1103	OFFICE	35.132	78	2,620	0.30
1104	OFFICE	25.348	56	1,814	0.31
1105	OFFICE	25.348	56	1,814	0.31
1106	OFFICE	25.348	56	1,814	0.31
1107	OFFICE	25.348	56	1,814	0.31
1108	OFFICE	282.505	629	1,814	3.52
1111	OFFICE	21.055	46	1,814	0.26
1114	UNOCC. WAREHOUSE	240.887	537	1,814	3.00
1115	OCC. WAREHOUSE	49.475	110	1,814	0.61
1116	OCC. WAREHOUSE	626.192	1,396	1,814	7.80
1117	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
1118	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
1120	OCC. WAREHOUSE	141.564	315	1,814	1.76
1200	OFFICE	145.455	324	2,620	1.25
1201	OCC. WAREHOUSE	581.818	1,297	1,814	7.25
1202	OFFICE	284.132	633	4,232	1.51
1207	OFFICE	20.194	45	1,814	0.25
1208	OFFICE	20.194	45	1,814	0.25
1209	OFFICE	76.317	170	1,814	0.95
1211	OFFICE	263.989	588	1,814	3.29
1212	OCC. WAREHOUSE	626.192	1,396	1,814	7.80
1220	OFFICE	74.404	165	1,814	0.92
1301	OCC. WAREHOUSE	569.090	1,269	2,217	5.80
1302	OCC. WAREHOUSE	80.782	180	1,814	1.00
1304	OCC. WAREHOUSE	52.468	117	1,814	0.65
1309	OCC. WAREHOUSE	68.194	152	1,814	0.85
1310	OCC. WAREHOUSE	68.194	152	1,814	0.85
1316	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
1317	OCC. WAREHOUSE	569.090	1,269	1,814	7.09
1400	OFFICE	0.000	0	1,814	0.00
1401	OFFICE	110.798	247	2,217	1.13
1403	OFFICE	77.308	172	1,814	0.96
1404	OFFICE	60.610	135	1,814	0.75
1407	OFFICE	25.348	56	1,814	0.31
1409	OCC. WAREHOUSE	68.194	152	1,814	0.85
1410	OCC. WAREHOUSE	68.194	152	1,814	0.85
1450	OCC. WAREHOUSE	199.540	444	1,814	2.48
1500	OFFICE	137.324	306	1,814	1.71
1502	OCC. WAREHOUSE	693.913	1,547	1,814	8.65
1601	OFFICE	335.403	747	1,814	4.18
1606	OFFICE	209.555	467	5,441	0.87

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1607	OCC. WAREHOUSE	71.093	158	1,814	0.88
1610	OCC. WAREHOUSE	67.579	150	1,814	0.84
1611	OCC. WAREHOUSE	81.667	182	2,217	0.83
1612	OCC. WAREHOUSE	79.422	177	1,814	0.99
1613	OCC. WAREHOUSE	22.658	50	1,814	0.28
1706	UNOCC. WAREHOUSE	49.944	111	1,814	0.62
1707	OCC. WAREHOUSE	92.964	207	1,814	1.15
1750	OCC. WAREHOUSE	102.029	227	2,217	1.04
1755	OCC. WAREHOUSE	74.002	165	2,217	0.75
1771	OCC. WAREHOUSE	174.667	389	1,814	2.17
1775	OCC. WAREHOUSE	548.916	1,224	1,814	6.84
1780	OCC. WAREHOUSE	205.054	457	1,814	2.55
HP255	OFFICE	0.000	0	1,814	0.00
HP265	OFFICE	0.000	0	1,814	0.00
HP275	OFFICE	0.000	0	1,814	0.00
HP285	OFFICE	0.000	0	1,814	0.00
HP295	OFFICE	0.000	0	1,814	0.00
HP405	OFFICE	0.000	0	1,814	0.00
HP1016	OCC. WAREHOUSE	54.814	122	1,814	0.68

FRENCH CREEK
NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
FC100	OCC. WAREHOUSE	673.547	1,502	4,635	3.28
FC190	OCC. WAREHOUSE	59.479	132	4,232	0.31
FC200	OCC. WAREHOUSE	169.137	377	3,023	1.26
FC241	OCC. WAREHOUSE	103.841	231	1,814	1.29
FC251	OCC. WAREHOUSE	121.267	270	3,426	0.80
FC301	OFFICE	27.494	61	1,814	0.34
FC302	OFFICE	42.300	94	1,814	0.52
FC303	OFFICE	80.603	179	1,814	1.00
FC312	OFFICE	41.659	92	2,217	0.42
FC313	OFFICE	24.226	54	1,814	0.30
FC364	OFFICE	38.449	85	1,814	0.47
FC573	OFFICE	0.000	0	1,814	0.00

DATE: 06/22/87

SHEET 1 OF 1

BEACH AREA

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BA101	OFFICE	35.760	104	2,620	0.45
BA102	OFFICE	156.161	454	1,814	2.87
BA103	OFFICE	49.639	144	2,620	0.63
BA104	OFFICE	0.000	0	4,232	0.00
BA105	OFFICE	156.161	454	3,426	1.52
BA128	OCC. WAREHOUSE	47.214	137	1,814	0.87

DATE: 06/22/87

SHEET 1 OF 1

RIFLE RANGE
NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
RR1	OFFICE	0.000	0	1,814	0.00
RR2	OFFICE	0.000	0	1,814	0.00
RR3	OFFICE	83.214	242	2,620	1.06
RR4	OFFICE	0.000	0	1,814	0.00
RR5	OFFICE	0.000	0	1,814	0.00
RR8	OFFICE	41.550	120	1,814	0.76
RR9	OFFICE	0.000	0	1,814	0.00
RR10	OFFICE	15.738	45	2,217	0.23
RR11	OFFICE	162.783	473	1,814	3.00
RR12	OFFICE	39.562	115	1,814	0.72

DATE: 06/22/87

SHEET 1 OF 1

COURTHOUSE BAY
NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BB2	OFFICE	26.343	76	1,814	0.48
BB5	OFFICE	22.233	64	1,814	0.40
BB8	OFFICE	0.000	0	1,814	0.00
BB10	OFFICE	20.355	59	1,814	0.37
BB11	OFFICE	0.000	0	7,456	0.00
BB12	OFFICE	0.000	0	7,859	0.00
BB13	OFFICE	0.000	0	7,859	0.00
BB14	OFFICE	0.000	0	7,456	0.00
BB15	OFFICE	13.885	40	1,814	0.25
BB16	OFFICE	13.885	40	1,814	0.25
BB27	OFFICE	23.610	68	1,814	0.43
BB28	OFFICE	50.015	145	1,814	0.92
BB45	OFFICE	0.000	0	1,814	0.00
BB50	OFFICE	72.628	211	1,814	1.33
BB51	OCC. WAREHOUSE	138.662	403	1,814	2.55
BB52	OFFICE	59.150	172	1,814	1.09
BB54	OFFICE	47.292	137	1,814	0.87
BB72	OFFICE	0.000	0	1,814	0.00
BB269	OFFICE	0.000	0	1,814	0.00

DATE: 06/22/87

SHEET 1 OF 1

CAMP JOHNSON

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M90	OFFICE	37.156	108	2,217	0.56
M100	OFFICE	17.422	50	1,814	0.32
M101	OFFICE	79.701	231	2,620	1.01
M102	OFFICE	18.754	54	1,814	0.34
M103	OFFICE	15.218	44	1,814	0.28
M104	OFFICE	57.799	168	3,023	0.63
M105	OFFICE	19.475	56	1,814	0.35
M112	OCC. WAREHOUSE	50.503	146	2,217	0.76
M116	OFFICE	38.234	111	1,814	0.70
M123	OFFICE	27.885	81	1,814	0.51
M124	OFFICE	27.885	81	1,814	0.51
M125	OFFICE	27.885	81	1,814	0.51
M126	OFFICE	27.885	81	1,814	0.51
M127	OFFICE	27.885	81	1,814	0.51
M128	OFFICE	87.495	254	1,814	1.61
M129	OFFICE	87.755	255	2,217	1.32
M130	OFFICE	50.438	146	1,814	0.92
M131	OFFICE	57.098	166	1,814	1.05
M132	OFFICE	67.512	196	1,814	1.24
M134	OCC. WAREHOUSE	97.392	283	2,217	1.46
M178	OFFICE	11.023	32	1,814	0.20
M201	OFFICE	23.737	69	1,814	0.43
M202	OFFICE	79.701	231	1,814	1.46
M205	OFFICE	0.000	0	1,814	0.00
M206	OFFICE	0.000	0	1,814	0.00
M207	OFFICE	0.000	0	1,814	0.00
M208	OFFICE	0.000	0	1,814	0.00
M209	OFFICE	0.000	0	1,814	0.00
M210	OFFICE	0.000	0	1,814	0.00
M215	OFFICE	27.885	81	1,814	0.51
M216	OFFICE	27.885	81	1,814	0.51
M231	OFFICE	0.000	0	2,620	0.00
M237	OFFICE	8.766	25	1,814	0.16
M240	OFFICE	61.156	177	2,620	0.78
M301	OCC. WAREHOUSE	30.478	88	1,814	0.56
M302	OFFICE	13.091	38	1,814	0.24
M303	OFFICE	45.389	132	2,217	0.68
M305	OFFICE	0.000	0	2,217	0.00
M307	OFFICE	35.705	103	2,217	0.53
M308	OFFICE	13.091	38	1,814	0.24
M309	OFFICE	0.000	0	2,217	0.00
M311	OFFICE	0.000	0	2,217	0.00
M313	OFFICE	0.000	0	2,217	0.00
M314	OCC. WAREHOUSE	30.478	88	1,814	0.56
M315	OFFICE	13.091	38	1,814	0.24
M316	OFFICE	0.000	0	2,217	0.00

DATE: 06/22/87

SHEET 1 OF 3

CAMP JOHNSON

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M318	OFFICE	0.000	0	2,217	0.00
M319	OCC. WAREHOUSE	30.478	88	1,814	0.56
M321	OFFICE	45.389	132	2,217	0.68
M323	OFFICE	27.885	81	2,620	0.35
M324	OFFICE	115.743	336	3,023	1.28
M326	OFFICE	39.538	115	1,814	0.72
M327	OFFICE	39.538	115	2,620	0.50
M401	OFFICE	13.091	38	1,814	0.24
M402	OFFICE	13.091	38	1,814	0.24
M403	OFFICE	45.389	132	2,217	0.68
M405	OFFICE	27.885	81	1,814	0.51
M406	OFFICE	27.885	81	1,814	0.51
M407	OFFICE	26.616	77	2,217	0.40
M408	OFFICE	12.984	37	1,814	0.23
M409	OFFICE	45.389	132	2,217	0.68
M411	OFFICE	27.885	81	1,814	0.51
M412	OFFICE	27.885	81	1,814	0.51
M413	OFFICE	26.616	77	1,814	0.49
M414	OFFICE	13.091	38	1,814	0.24
M415	OCC. WAREHOUSE	30.478	88	1,814	0.56
M416	OFFICE	0.000	0	2,217	0.00
M418	OFFICE	26.616	77	2,217	0.40
M419	OFFICE	13.091	38	1,814	0.24
M420	OFFICE	45.389	132	2,217	0.68
M422	OFFICE	45.389	132	2,217	0.68
M424	OFFICE	115.743	336	1,814	2.13
M441	OFFICE	0.000	0	1,814	0.00
M501	OCC. WAREHOUSE	30.478	88	1,814	0.56
M502	OFFICE	13.091	38	1,814	0.24
M503	OFFICE	0.000	0	2,217	0.00
M504	OFFICE	0.000	0	2,217	0.00
M506	OCC. WAREHOUSE	30.478	88	1,814	0.56
M507	OFFICE	0.000	0	2,217	0.00
M509	OFFICE	0.000	0	2,217	0.00
M511	OFFICE	0.000	0	1,814	0.00
M512	OCC. WAREHOUSE	30.478	88	1,814	0.56
M513	OFFICE	13.091	38	1,814	0.24
M514	OFFICE	0.000	0	2,217	0.00
M516	OFFICE	0.000	0	6,247	0.00
M518	OFFICE	0.000	0	2,217	0.00
M520	OFFICE	13.091	38	1,814	0.24
M521	OFFICE	0.000	0	2,217	0.00
M522	OFFICE	0.000	0	2,217	0.00
M601	OFFICE	13.091	38	1,814	0.24
M602	OFFICE	13.091	38	1,814	0.24
M603	OFFICE	13.091	38	1,814	0.24

DATE: 06/22/87

SHEET 2 OF 3

CAMP JOHNSON
NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M604	OFFICE	0.000	0	2,217	0.00
M606	OCC. WAREHOUSE	30.478	88	1,814	0.56
M607	OFFICE	0.000	0	2,217	0.00
M609	OFFICE	0.000	0	2,217	0.00
M611	OFFICE	51.379	149	2,217	0.77
M612	OFFICE	13.091	38	1,814	0.24
M613	OFFICE	13.091	38	1,814	0.24
M614	OFFICE	0.000	0	2,217	0.00
M616	OFFICE	0.000	0	2,217	0.00
M619	OFFICE	13.091	38	1,814	0.24
M620	OFFICE	13.089	38	1,814	0.24
M621	OFFICE	0.000	0	2,217	0.00
M622	OFFICE	0.000	0	2,217	0.00

DATE: 06/22/87

SHEET 3 OF 3

CAMP GEIGER

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
G770	HOSPITAL	56.922	165	1,814	1.04
TC701	OFFICE	0.000	0	1,814	0.00
TC704	OFFICE	0.000	0	2,217	0.00
TC705	OFFICE	0.000	0	2,217	0.00
TC706	OFFICE	0.000	0	2,217	0.00
TC707	OFFICE	0.000	0	2,217	0.00
TC708	OFFICE	0.000	0	2,217	0.00
TC709	OFFICE	0.000	0	2,217	0.00
TC710	OFFICE	0.000	0	2,217	0.00
TC711	OFFICE	0.000	0	2,217	0.00
TC712	OFFICE	0.000	0	2,217	0.00
TC714	OFFICE	0.000	0	2,217	0.00
TC715	OFFICE	0.000	0	2,217	0.00
TC716	OFFICE	0.000	0	2,217	0.00
TC717	OFFICE	0.000	0	2,217	0.00
TC718	OFFICE	0.000	0	2,217	0.00
TC719	OFFICE	0.000	0	2,217	0.00
TC726	OFFICE	0.000	0	2,217	0.00
TC727	OFFICE	0.000	0	2,217	0.00
TC728	OFFICE	0.000	0	2,217	0.00
TC729	OFFICE	0.000	0	2,217	0.00
TC735	OFFICE	23.602	68	1,814	0.43
TC736	OFFICE	0.000	0	2,217	0.00
TC737	OFFICE	0.000	0	2,217	0.00
TC738	OFFICE	0.000	0	2,217	0.00
TC739	OFFICE	0.000	0	2,217	0.00
TC740	OFFICE	0.000	0	2,217	0.00
TC741	OFFICE	0.000	0	2,217	0.00
TC742	OFFICE	0.000	0	2,217	0.00
TC743	OFFICE	0.000	0	2,217	0.00
TC744	OFFICE	0.000	0	2,217	0.00
TC745	OFFICE	0.000	0	2,217	0.00
TC748	OFFICE	0.000	0	2,217	0.00
TC749	OFFICE	0.000	0	2,217	0.00
TC750	OFFICE	0.000	0	2,217	0.00
TC751	OFFICE	0.000	0	2,217	0.00
TC752	OFFICE	0.000	0	2,217	0.00
TC753	OFFICE	0.000	0	2,217	0.00
TC754	OFFICE	0.000	0	2,217	0.00
TC804	OFFICE	0.000	0	2,217	0.00
TC805	OFFICE	0.000	0	2,217	0.00
TC806	OFFICE	0.000	0	2,217	0.00
TC807	OFFICE	0.000	0	2,217	0.00
TC808	OFFICE	0.000	0	2,217	0.00
TC809	OFFICE	0.000	0	2,217	0.00
TC810	OFFICE	0.000	0	2,217	0.00

DATE: 06/24/87

SHEET 1 OF 4

CAMP GEIGER
NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC812	OFFICE	0.000	0	2,217	0.00
TC814	OFFICE	0.000	0	2,217	0.00
TC815	OFFICE	0.000	0	2,217	0.00
TC816	OFFICE	0.000	0	2,217	0.00
TC817	OFFICE	0.000	0	2,217	0.00
TC818	OFFICE	0.000	0	2,217	0.00
TC819	OFFICE	0.000	0	2,217	0.00
TC826	OFFICE	0.000	0	2,217	0.00
TC827	OFFICE	0.000	0	2,217	0.00
TC828	OFFICE	0.000	0	2,217	0.00
TC829	OFFICE	0.000	0	2,217	0.00
TC832	OFFICE	23.602	68	1,814	0.43
TC834	OFFICE	23.602	68	1,814	0.43
TC836	OFFICE	0.000	0	2,217	0.00
TC837	OFFICE	0.000	0	2,217	0.00
TC838	OFFICE	0.000	0	2,217	0.00
TC839	OFFICE	0.000	0	2,217	0.00
TC840	OFFICE	0.000	0	2,217	0.00
TC841	OFFICE	0.000	0	2,217	0.00
TC842	OFFICE	0.000	0	2,217	0.00
TC844	OFFICE	0.000	0	2,217	0.00
TC845	OFFICE	0.000	0	2,217	0.00
TC846	OFFICE	87.037	253	1,814	1.60
TC848	OFFICE	0.000	0	2,217	0.00
TC850	OFFICE	0.000	0	2,217	0.00
TC851	OFFICE	0.000	0	2,217	0.00
TC853	OFFICE	0.000	0	2,217	0.00
TC854	OFFICE	0.000	0	2,217	0.00
TC855	OFFICE	0.000	0	2,217	0.00
TC900	OFFICE	55.376	161	1,814	1.02
TC910	OFFICE	37.425	108	2,620	0.47
TC950	OFFICE	0.000	0	2,217	0.00
TC951	OFFICE	0.000	0	2,217	0.00
TC1003	OFFICE	0.000	0	2,217	0.00
TC1004	OFFICE	0.000	0	2,217	0.00
TC1005	OFFICE	0.000	0	2,217	0.00
TC1006	OFFICE	0.000	0	2,217	0.00
TC1007	OFFICE	0.000	0	2,217	0.00
TC1008	OFFICE	0.000	0	2,217	0.00
TC1009	OFFICE	0.000	0	2,217	0.00
TC1010	OFFICE	0.000	0	2,217	0.00
TC1012	OFFICE	0.000	0	2,217	0.00
TC1013	OFFICE	0.000	0	2,217	0.00
TC1015	OFFICE	0.000	0	2,217	0.00
TC1016	OFFICE	0.000	0	2,217	0.00
TC1017	OFFICE	0.000	0	2,217	0.00

DATE: 06/24/87

SHEET 2 OF 4

CAMP GEIGER

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1018	OFFICE	0.000	0	2,217	0.00
TC1019	OFFICE	0.000	0	2,217	0.00
TC1026	OFFICE	0.000	0	2,217	0.00
TC1027	OFFICE	0.000	0	2,217	0.00
TC1028	OFFICE	0.000	0	2,217	0.00
TC1029	OFFICE	0.000	0	2,217	0.00
TC1036	OFFICE	0.000	0	2,217	0.00
TC1037	OFFICE	0.000	0	2,217	0.00
TC1038	OFFICE	0.000	0	2,217	0.00
TC1039	OFFICE	0.000	0	2,217	0.00
TC1040	OFFICE	0.000	0	2,217	0.00
TC1041	OFFICE	0.000	0	2,217	0.00
TC1042	OFFICE	0.000	0	2,217	0.00
TC1044	OFFICE	0.000	0	2,217	0.00
TC1045	OFFICE	0.000	0	2,217	0.00
TC1046	OFFICE	0.000	0	2,217	0.00
TC1047	OFFICE	0.000	0	2,217	0.00
TC1048	OFFICE	0.000	0	2,217	0.00
TC1049	OFFICE	0.000	0	2,217	0.00
TC1050	OFFICE	0.000	0	2,217	0.00
TC1051	OFFICE	0.000	0	2,217	0.00
TC1052	OFFICE	0.000	0	2,217	0.00
TC1053	OFFICE	0.000	0	2,217	0.00
TC1054	OFFICE	0.000	0	2,217	0.00
TC1055	OFFICE	0.000	0	2,217	0.00
TC1056	OFFICE	0.000	0	2,217	0.00
TC1057	OFFICE	0.000	0	2,217	0.00
TC1058	OFFICE	0.000	0	2,217	0.00
TC1059	OFFICE	0.000	0	2,217	0.00
TC1060	OFFICE	0.000	0	2,217	0.00
TC1061	OFFICE	0.000	0	2,217	0.00
TC1062	OFFICE	0.000	0	2,217	0.00
TC1063	OFFICE	0.000	0	2,217	0.00
TC1064	OFFICE	0.000	0	2,217	0.00
TC1065	OFFICE	0.000	0	2,217	0.00
TC1066	OFFICE	0.000	0	2,217	0.00
TC1067	OFFICE	0.000	0	2,217	0.00
TC1068	OFFICE	0.000	0	2,217	0.00
TC1069	OFFICE	0.000	0	2,217	0.00
TC1110	OFFICE	0.000	0	2,217	0.00
TC1119	OFFICE	0.000	0	2,217	0.00
TC1131	OFFICE	0.000	0	2,217	0.00
TC1132	OFFICE	0.000	0	2,217	0.00
TC1140	OFFICE	0.000	0	2,217	0.00
TC1141	OFFICE	0.000	0	2,217	0.00
TC1142	OFFICE	0.000	0	2,217	0.00

DATE: 06/24/87

CAMP GEIGER

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1143	OFFICE	0.000	0	2,217	0.00
TC1160	OFFICE	0.000	0	2,217	0.00
TC1161	OFFICE	0.000	0	2,217	0.00
TC1162	OFFICE	0.000	0	2,217	0.00

DATE: 06/24/87

SHEET 4 OF 4

PARADISE POINT

NIGHT SETBACK:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
2600	OFFICE	0.000	0	1,814	0.00
2603	OFFICE	0.000	0	5,441	0.00
2624	OFFICE	45.590	132	1,814	0.84
2625	OFFICE	15.704	45	1,814	0.28
2626	OFFICE	20.364	59	1,814	0.37
2627	OFFICE	20.364	59	1,814	0.37
2628	OFFICE	22.406	65	1,814	0.41
2629	OCC. WAREHOUSE	33.144	96	1,814	0.61

DATE: 06/22/87

SHEET 1 OF 1

4.5 OUTSIDE AIR LIMIT SHUTOFF

Introduction - This ECO discusses energy and cost savings which would realized by installing steam supply shutoff controls in many of the buildings at this installation. These controls would be stand-alone controls that are compatible with the existing Energy Management Control System (EMCS) which is controlled by a Hewlett Packard (HP) 1000 computer.

Existing Condition - The heating season lasts for approximately 6 months. The building steam supply is manually shut off during the non-heating season but there are periods of mild temperatures during the heating season when the steam is not shut off.

Substantial amounts of energy can be saved by reducing the number of hours of operation of auxiliary equipment. Reducing the hours the steam system is active also results in savings by eliminating the heat loss from the piping and related equipment. Both savings can be realized by installing an automatic steam shut off valve to turn off the steam supply for comfort heating and by installing controls to shut off the auxiliary equipment, primarily hot water pumps, whenever the outside temperature exceeds 65 deg. F.

Calculation Methodology - Following is the methodology used to calculate energy savings from outside air limit shutoff.

Reference: CR 82.030 "Standardized EMCS Energy Savings Calculation." pg. 47

$$\text{Energy Savings} = \text{Auxiliary Savings} + \text{System Loss Savings} \times 1\ \text{MBtu}/1\text{x}10^{6} \times 1/\text{Plant Eff.}$$

Where:

Energy Savings = Rate of heat transfer from the building boundary in MBtu/yr

Auxiliary Savings = Savings resulting from shutting down electrically powered auxiliary equipment, primarily hot water pumps (see next page)

System Loss Savings = Savings in Btu/hr resulting from an elimination of heat losses from the steam piping and equipment. See Section 4.3 "Upgrade Pipe Insulation"

Plant Eff. = Efficiency of the steam generating plant (See Section 3.2 "Fuel Costs and Efficiencies")

Auxiliary Savings = HPxLx(0.746 kw/hp) x HW x 3412 Btu/kw-hr

Where:

HP = Motor nameplate horsepower (total of continuously running pumps) (see below)

HW = Hours in winter outside temperature is above winter limits (65 deg. F) in hours per year (see below)

L = Load factor, use 0.8 per Reference

BHP = BHP/motor eff.

Where:

BHP = Pump horsepower (see below)

Motor eff. = Motor efficiency (use 0.75)

$$BHP = \frac{GPM \times H \times Sp.\ gr.}{3960 \times \text{pump eff.}}$$

Where:

GPM = Gallons per minute (see below)

H = Head in feet (use 25)

Sp.gr. = Specific gravity = 1.0

Pump eff = Pump efficiency (use 0.75)

$$GPM = \frac{Q}{60WCT}$$

Where:

$Q = BTT \times AZ \times (Td - To)$

BTT = Building thermal transmission in Btu/hr-deg. F sq. ft. (see Section 4.4, "Night Setback")

AZ = Area of zone being served in sq. ft.

To = Design outdoor temperature = 23 deg. F

Td = Indoor Design Temp. (see Section 3.3, "General Analysis Methods")

W = Density, lb/gal. = 8.33

C = Specific heat of water, Btu/lb-deg. F = 1.0

T = Water temperature differential, deg. F (Use 20)

HW = Hours in winter outside temperature is above 65 deg. F

Reference: NAVFAC P-89 Engineering Weather Data

Month	Hours/yr
Nov.	138
Dec.	57
Jan.	31
Feb.	34
March	83
April	274
	617 hours/yr

Calculation Example:

Given:
1. HP = 5
2. Plant Eff. = 0.73
3. System Loss Savings = 5,000 Btu/hr.

$$\text{Energy Savings} = [(5 \times 0.8 \times 0.746 \times 617 \times 3412) + 5000 \times 617] \times 1/1 \times 10^6 \times 1/0.73$$

$$= 12.83 \text{ MBtu/yr}$$

Cost Estimate - The items and associated costs required to accomplish outside air limit shutoff are as follows:

Hot Water Heat (Steam/H.W. Converter)

Item	Materials	Labor	Total
Outside air temperature sensor	119	17	136
Motorized steam valve	414	92	506
Pneumatic valve controller	204	44	248
EP transducer	239	44	283

Total Cost = $1173/building

Steam Heat (AHU, radiator, or steam unit heater)

Same as for Hot Water Heat plus the following cost per air handling unit:

Item	Materials	Labor	Total
Control relay-start/stop	25	44	69
Pneumatic damper actuator	133	30	163
Control relay-damper	25	44	69
EP valve	72	30	102

Total = $1173/building + $403/air handling unit

Summary - The following pages present individual building energy savings and cost estimates for all buildings at each installation and the ECIP sheets for all outside air limit shutoff ECOs with an SIR greater than 1.0.

The results of the life-cycle cost analysis are listed below:

INSTALLATION	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITAL COST $	SIR
Rifle Range	534.086	1,553	7,038	2.24
Beach Area	290.458	845	4,764	1.80
Hadnot Point	1,065.864	2,378	16,055	1.50
French Creek	72.327	162	1,173	1.40
Air Station	368.914	1,074	8,650	1.26
Hospital Point	58.325	130	1,173	1.12
Camp Johnson	133.971	390	3,555	1.11
Courthouse Bay	0	0	0	0.00
Camp Geiger	0	0	0	0.00
Paradise Point	0	0	0	0.00

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: RIFLE RANGE
PROJECT TITLE: OUTSIDE AIR LIMIT SHUTOFF
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	7,038
B. SIOH		387
C. DESIGN COST		422
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		7,063
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	7,063

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	534	1,554	10.18	15,822
F. TOTAL	$	534	1,554		15,822

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 5,221
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 1,554

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 15,822

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.2

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	BEACH AREA	PROJECT NO.	
PROJECT TITLE:	OUTSIDE AIR LIMIT SHUTOFF	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	4,764
B. SIOH		262
C. DESIGN COST		286
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		4,781
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	4,781

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	290	845	10.18	8,604
F. TOTAL	$	290	845		8,604

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 2,839
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 845

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 8,604

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HADNOT POINT	PROJECT NO.	
PROJECT TITLE:	OUTSIDE AIR LIMIT SHUTOFF	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	16,055
B. SIOH		883
C. DESIGN COST		963
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		16,111
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	16,111

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	1,066	2,377	10.18	24,197
F. TOTAL	$	1,066	2,377		24,197

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 7,985
a. IF 3D1 IS => 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS => 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 2,377

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 24,197

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.5

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: FRENCH CREEK
PROJECT TITLE: OUTSIDE AIR LIMIT SHUTOFF
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	1,173
B. SIOH		65
C. DESIGN COST		70
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		1,177
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	1,177

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	72	161	10.18	1,642
F. TOTAL	$	72	161		1,642

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 542
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 161

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,642

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.4

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: NEW RIVER AIR STATION
PROJECT TITLE: OUTSIDE AIR LIMIT SHUTOFF
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	8,650
B. SIOH		476
C. DESIGN COST		519
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		8,680
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	8,680

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	369	1,074	10.18	10,929
F. TOTAL	$	369	1,074		10,929

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-) $ 0

(1) DISCOUNT FACTOR (TABLE 1) 7.61

(2) DISCOUNTED SAVING/COST (3AX3A1) $ 0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 3,606

a. IF 3D1 IS => 3C GO TO ITEM 4

b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0

c. IF 3D1b IS => 1 GO TO ITEM 4

d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 1,074

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 10,929

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.3

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HOSPITAL POINT	PROJECT NO.	
PROJECT TITLE:	OUTSIDE AIR LIMIT SHUTOFF	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	1,173
B. SIOH		65
C. DESIGN COST		70
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		1,177
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	1,177

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	58	130	10.18	1,324
F. TOTAL	$	58	130		1,324

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 437
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 130

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,324

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP JOHNSON	PROJECT NO.	
PROJECT TITLE:	OUTSIDE AIR LIMIT SHUTOFF	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	3,555
B. SIOH		196
C. DESIGN COST		213
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		3,567
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	3,567

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	134	390	10.18	3,969
F. TOTAL	$	134	390		3,969

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1,310
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 390

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,969

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.1

RIFLE RANGE
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
RR1	OFFICE	105.654	307	1,173	3.01
RR2	OFFICE	103.797	302	1,173	2.95
RR3	OFFICE	25.711	74	1,979	0.43
RR4	OFFICE	97.647	284	1,173	2.78
RR5	OFFICE	105.878	308	1,173	3.01
RR8	OFFICE	34.635	100	1,173	0.98
RR9	OFFICE	49.622	144	1,173	1.41
RR10	OFFICE	14.689	42	1,576	0.31
RR11	OFFICE	71.488	208	1,173	2.03
RR12	OFFICE	23.784	69	1,173	0.67

DATE: 06/22/87

SHEET 1 OF 1

BEACH AREA

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BA101	OFFICE	5.636	16	1,979	0.09
BA102	OFFICE	40.901	119	1,173	1.16
BA103	OFFICE	22.113	64	1,979	0.37
BA104	OFFICE	249.557	726	3,591	2.32
BA105	OFFICE	24.707	71	2,785	0.29
BA128	OCC. WAREHOUSE	0.095	0	1,173	0.00

DATE: 06/22/87

SHEET 1 OF 1

HADNOT POINT
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1	OFFICE	114.009	254	1,173	2.19
2	OFFICE	43.080	96	1,173	0.83
4	OFFICE	2.090	4	1,576	0.03
6	OFFICE	54.001	120	5,203	0.23
8	OFFICE	53.838	120	5,203	0.23
11	OCC. WAREHOUSE	5.670	12	3,591	0.03
13	OFFICE	39.146	87	1,173	0.75
14	OFFICE	1.549	4	1,173	0.03
15	OFFICE	38.205	87	1,173	0.75
16	OFFICE	2.062	4	1,173	0.03
17	OFFICE	22.024	49	1,173	0.42
18	OFFICE	13.549	30	1,173	0.26
25	OFFICE	55.707	124	1,173	1.07
27	OFFICE	21.095	47	1,173	0.40
41	OFFICE	7.589	17	1,173	0.15
43	OFFICE	11.332	25	1,173	0.21
50	OFFICE	2.583	6	1,173	0.05
54	OFFICE	63.738	142	1,979	0.72
58	OFFICE	21.680	48	2,382	0.20
59	OFFICE	47.862	106	1,979	0.54
63	OFFICE	57.199	127	3,591	0.36
65	OFFICE	63.243	141	4,800	0.29
66	OFFICE	4.623	11	1,173	0.10
67	OFFICE	16.109	37	1,173	0.32
84	OFFICE	64.018	142	1,576	0.91
102	OFFICE	53.092	118	4,800	0.25
106	OFFICE	29.644	66	1,576	0.42
107	OCC. WAREHOUSE	29.917	66	1,576	0.42
114	OFFICE	23.542	52	1,173	0.45
115	OFFICE	42.870	95	1,576	0.61
117	OCC. WAREHOUSE	12.175	27	1,173	0.23
119	OFFICE	16.516	36	1,173	0.31
123	OFFICE	26.044	58	1,173	0.50
127	OFFICE	24.157	53	1,173	0.46
201	OFFICE	42.862	95	1,576	0.61
203	OFFICE	19.445	43	1,173	0.37
206	OCC. WAREHOUSE	30.649	68	1,576	0.43
214	OFFICE	25.867	57	1,173	0.49
216	OFFICE	25.640	57	1,173	0.49
219	OFFICE	24.568	54	1,173	0.47
221	OFFICE	2.926	6	1,173	0.05
223	OFFICE	32.392	72	1,173	0.62
226	OCC. WAREHOUSE	29.279	65	1,576	0.42
233	OFFICE	14.026	31	1,173	0.27
300	OFFICE	46.031	102	1,576	0.66
302	OFFICE	22.788	50	1,173	0.43

DATE: 06/23/87

SHEET 1 OF 4

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
304	OFFICE	30.966	69	1,173	0.59
307	OCC. WAREHOUSE	28.748	64	1,576	0.41
314	OFFICE	31.621	70	1,576	0.45
315	OFFICE	24.623	54	1,173	0.47
317	OFFICE	27.778	61	1,173	0.53
320	OFFICE	37.677	84	1,173	0.72
400	OFFICE	33.179	73	1,173	0.63
401	OFFICE	45.024	100	1,576	0.64
403	OFFICE	15.471	34	1,173	0.29
408	OFFICE	48.792	108	1,576	0.70
412	OFFICE	81.958	182	1,173	1.58
416	OFFICE	28.285	63	1,173	0.54
417	OFFICE	46.846	104	5,203	0.20
419	OFFICE	19.594	43	1,173	0.37
420	OFFICE	105.048	234	1,173	2.02
422	OFFICE	52.773	117	5,203	0.22
423	OFFICE	31.285	69	1,173	0.60
424	OCC. WAREHOUSE	30.183	67	1,576	0.43
500	OCC. WAREHOUSE	43.723	97	1,576	0.62
501	OFFICE	18.768	41	1,173	0.36
502	OFFICE	66.285	147	5,203	0.28
508	OFFICE	30.722	69	1,173	0.60
509	OCC. WAREHOUSE	32.508	72	1,576	0.46
516	OFFICE	22.928	51	1,173	0.44
518	OFFICE	7.395	16	1,173	0.14
520	OFFICE	14.893	33	1,173	0.28
526	OFFICE	18.697	41	1,173	0.36
751	OFFICE	85.477	190	2,785	0.69
898	OFFICE	3.386	8	1,173	0.07
900	OFFICE	12.737	28	1,173	0.24
901	OCC. WAREHOUSE	23.839	53	2,785	0.19
902	OCC. WAREHOUSE	84.885	189	1,576	1.21
904	OCC. WAREHOUSE	6.468	14	1,173	0.12
905	OFFICE	41.534	92	1,173	0.80
907	OCC. WAREHOUSE	36.267	80	1,173	0.69
908	OCC. WAREHOUSE	43.932	97	2,382	0.41
909	OCC. WAREHOUSE	87.560	195	1,173	1.68
910	OCC. WAREHOUSE	13.321	29	1,173	0.25
914	OFFICE	25.876	57	1,173	0.49
915	OCC. WAREHOUSE	96.464	215	1,173	1.86
916	OCC. WAREHOUSE	3.212	15	1,173	0.13
1002	OFFICE	0.860	1	1,173	0.01
1004	UNOCC. WAREHOUSE	2.495	5	1,173	0.04
1005	OFFICE	4.928	12	1,173	0.11
1006	OFFICE	19.052	42	1,576	0.27
1011	OCC. WAREHOUSE	14.307	31	1,576	0.20

DATE: 06/23/87 SHEET 2 OF 4

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1012	OCC. WAREHOUSE	2.732	6	1,173	0.05
1015	OCC. WAREHOUSE	8.710	20	1,173	0.18
1041	OFFICE	76.957	171	4,397	0.39
1100	OFFICE	6.207	13	1,173	0.11
1101	OCC. WAREHOUSE	88.932	198	6,009	0.33
1103	OFFICE	49.936	111	1,979	0.57
1104	OFFICE	10.297	22	1,173	0.19
1105	OFFICE	11.198	24	1,173	0.21
1106	OFFICE	9.017	20	1,173	0.17
1107	OFFICE	6.925	15	1,173	0.13
1108	OFFICE	107.372	239	1,173	2.07
1111	OFFICE	8.810	19	1,173	0.16
1114	UNOCC. WAREHOUSE	0.816	1	1,173	0.01
1115	OCC. WAREHOUSE	0.753	1	1,173	0.01
1116	OCC. WAREHOUSE	4.436	19	1,173	0.16
1117	OCC. WAREHOUSE	4.253	18	1,173	0.15
1118	OCC. WAREHOUSE	50.875	113	1,173	0.98
1120	OCC. WAREHOUSE	22.871	51	1,173	0.44
1200	OFFICE	56.657	126	1,979	0.64
1201	OCC. WAREHOUSE	61.347	136	1,173	1.18
1202	OFFICE	150.505	335	3,591	0.94
1207	OFFICE	9.723	21	1,173	0.18
1208	OFFICE	9.519	21	1,173	0.18
1209	OFFICE	28.142	64	1,173	0.55
1211	OFFICE	11.929	26	1,173	0.23
1212	OCC. WAREHOUSE	4.721	20	1,173	0.17
1220	OFFICE	18.822	41	1,173	0.36
1301	OCC. WAREHOUSE	79.598	177	1,576	1.14
1302	OCC. WAREHOUSE	3.591	8	1,173	0.06
1304	OCC. WAREHOUSE	13.546	30	1,173	0.26
1309	OCC. WAREHOUSE	17.830	39	1,173	0.34
1310	OCC. WAREHOUSE	16.369	36	1,173	0.31
1316	OCC. WAREHOUSE	4.717	19	1,173	0.16
1317	OCC. WAREHOUSE	33.728	83	1,173	0.72
1400	OFFICE	10.396	23	1,173	0.20
1401	OFFICE	36.785	82	1,576	0.52
1403	OFFICE	34.276	76	1,173	0.66
1404	OFFICE	26.514	59	1,173	0.51
1407	OFFICE	25.752	57	1,173	0.49
1409	OCC. WAREHOUSE	15.705	35	1,173	0.30
1410	OCC. WAREHOUSE	13.815	30	1,173	0.26
1450	OCC. WAREHOUSE	8.967	23	1,173	0.19
1500	OFFICE	60.480	134	1,173	1.16
1502	OCC. WAREHOUSE	66.795	148	1,173	1.28
1601	OFFICE	64.641	144	1,173	1.24
1606	OFFICE	36.230	80	4,800	0.17

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1607	OCC. WAREHOUSE	9.704	21	1,173	0.18
1610	OCC. WAREHOUSE	10.730	23	1,173	0.20
1611	OCC. WAREHOUSE	12.766	28	1,576	0.18
1612	OCC. WAREHOUSE	10.113	22	1,173	0.19
1613	OCC. WAREHOUSE	0.554	1	1,173	0.01
1706	UNOCC. WAREHOUSE	2.169	4	1,173	0.04
1707	OCC. WAREHOUSE	15.207	33	1,173	0.29
1750	OCC. WAREHOUSE	10.485	23	1,576	0.15
1755	OCC. WAREHOUSE	8.747	19	1,576	0.12
1771	OCC. WAREHOUSE	3.687	10	1,173	0.09
1775	OCC. WAREHOUSE	3.387	15	1,173	0.13
1780	OCC. WAREHOUSE	2.183	7	1,173	0.06
HP255	OFFICE	2.533	7	1,173	0.06
HP265	OFFICE	2.618	7	1,173	0.06
HP275	OFFICE	2.497	7	1,173	0.06
HP285	OFFICE	2.784	8	1,173	0.07
HP295	OFFICE	2.533	7	1,173	0.06
HP405	OFFICE	3.807	10	1,173	0.09
HP1016	OCC. WAREHOUSE	14.054	31	1,173	0.27

FRENCH CREEK
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
FC100	OCC. WAREHOUSE	77.924	173	3,994	0.44
FC190	OCC. WAREHOUSE	17.728	39	3,591	0.11
FC200	OCC. WAREHOUSE	38.664	86	2,382	0.36
FC241	OCC. WAREHOUSE	1.847	5	1,173	0.04
FC251	OCC. WAREHOUSE	39.265	87	2,785	0.31
FC301	OFFICE	23.726	52	1,173	0.45
FC302	OFFICE	38.360	85	1,173	0.73
FC303	OFFICE	72.327	162	1,173	1.40
FC312	OFFICE	16.422	36	1,576	0.23
FC313	OFFICE	3.313	7	1,173	0.06
FC364	OFFICE	4.825	11	1,173	0.09
FC573	OFFICE	4.157	11	1,173	0.09

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AIR STATION
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
AS114	OFFICE	13.437	39	1,173	0.38
AS118	OCC. WAREHOUSE	15.492	45	1,576	0.32
AS122	OFFICE	27.276	79	1,576	0.57
AS124	OCC. WAREHOUSE	31.923	92	1,173	0.90
AS130	OFFICE	51.217	149	1,576	1.08
AS202	OFFICE	66.119	192	2,382	0.92
AS205	OFFICE	23.428	68	3,188	0.24
AS208	OFFICE	2.210	6	1,173	0.06
AS215	OFFICE	62.139	180	1,173	1.77
AS216	OFFICE	59.747	173	1,173	1.70
AS217	OFFICE	60.382	175	1,979	1.02
AS232	OFFICE	18.478	53	1,979	0.31
AS236	OFFICE	24.731	71	1,173	0.70
AS302	OFFICE	29.180	84	1,576	0.61
AS312	OFFICE	1.878	6	1,173	0.06
AS320	OFFICE	1.209	4	1,173	0.04
AS414	OFFICE	21.094	61	1,173	0.60
AS424	OCC. WAREHOUSE	97.664	284	1,576	2.07
AS425	OFFICE	4.997	14	1,173	0.14
AS502	OFFICE	37.765	109	1,173	1.07
AS4012	OFFICE	13.361	39	1,173	0.38
AS4030	OFFICE	6.497	20	1,173	0.19
AS4035	OFFICE	2.331	8	1,173	0.07
AS4110	OCC. WAREHOUSE	8.313	24	1,173	0.23
AS4120	OFFICE	4.324	12	2,382	0.06
AS4122	OFFICE	4.120	11	1,576	0.08
AS4141	OCC. WAREHOUSE	4.189	12	1,576	0.08
AS4145	OFFICE	2.714	7	1,576	0.05
AS4146	OCC. WAREHOUSE	3.682	11	1,173	0.11
AS4157	OFFICE	5.954	17	1,173	0.17
AS4158	OCC. WAREHOUSE	13.033	40	1,173	0.40

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HOSPITAL POINT

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
H14	OFFICE	2.722	7	1,173	0.06
H15A	OFFICE	711.213	1,586	4,800	3.35
H16	OFFICE	6.811	15	1,173	0.13
H17	OCC. WAREHOUSE	43.307	96	1,173	0.83
H17N	OCC. WAREHOUSE	58.325	130	1,173	1.12
H18	OCC. WAREHOUSE	22.605	50	1,173	0.43
H19	OCC. WAREHOUSE	20.379	45	1,173	0.39
H21	OFFICE	31.205	69	1,173	0.60
H23	OFFICE	14.637	35	1,173	0.30
H24	OFFICE	9.419	23	1,173	0.20
H36	OCC. WAREHOUSE	5.106	11	1,173	0.09
H39	OFFICE	1.675	3	1,173	0.03

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CAMP JOHNSON

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M90	OFFICE	16.314	47	1,576	0.34
M100	OFFICE	17.708	51	1,173	0.50
M101	OFFICE	41.194	119	1,979	0.69
M102	OFFICE	24.583	71	1,173	0.70
M103	OFFICE	3.163	9	1,173	0.09
M104	OFFICE	43.398	126	2,382	0.60
M105	OFFICE	18.461	53	1,173	0.52
M112	OCC. WAREHOUSE	18.055	52	1,576	0.38
M116	OFFICE	1.079	3	1,173	0.03
M123	OFFICE	7.676	22	1,173	0.21
M124	OFFICE	8.553	24	1,173	0.24
M125	OFFICE	5.245	15	1,173	0.14
M126	OFFICE	6.651	19	1,173	0.18
M127	OFFICE	7.374	21	1,173	0.21
M128	OFFICE	15.002	44	1,173	0.43
M129	OFFICE	44.570	129	1,576	0.94
M130	OFFICE	5.932	17	1,173	0.17
M131	OFFICE	2.407	7	1,173	0.07
M132	OFFICE	26.851	78	1,173	0.76
M134	OCC. WAREHOUSE	6.951	20	1,576	0.14
M178	OFFICE	9.469	27	1,173	0.26
M201	OFFICE	10.023	29	1,173	0.28
M202	OFFICE	31.813	92	1,173	0.90
M205	OFFICE	8.934	25	1,173	0.25
M206	OFFICE	8.454	24	1,173	0.24
M207	OFFICE	6.690	19	1,173	0.19
M208	OFFICE	7.666	22	1,173	0.21
M209	OFFICE	9.013	26	1,173	0.25
M210	OFFICE	6.500	18	1,173	0.18
M215	OFFICE	18.621	54	1,173	0.53
M216	OFFICE	9.339	27	1,173	0.26
M231	OFFICE	11.419	33	1,979	0.19
M237	OFFICE	7.866	23	1,173	0.22
M240	OFFICE	11.835	34	1,979	0.19
M301	OCC. WAREHOUSE	6.778	19	1,173	0.19
M302	OFFICE	6.531	19	1,173	0.18
M303	OFFICE	28.955	84	1,576	0.61
M305	OFFICE	2.754	8	1,576	0.05
M307	OFFICE	1.359	3	1,576	0.02
M308	OFFICE	3.731	10	1,173	0.10
M309	OFFICE	23.060	67	1,576	0.48
M311	OFFICE	21.756	63	1,576	0.46
M313	OFFICE	0.934	2	1,576	0.01
M314	OCC. WAREHOUSE	6.370	18	1,173	0.18
M315	OFFICE	6.543	19	1,173	0.18
M316	OFFICE	1.551	4	1,576	0.03

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CAMP JOHNSON
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M318	OFFICE	1.027	2	1,576	0.02
M319	OCC. WAREHOUSE	9.099	26	1,173	0.25
M321	OFFICE	2.202	6	1,576	0.04
M323	OFFICE	5.957	17	1,979	0.10
M324	OFFICE	94.413	274	2,382	1.32
M326	OFFICE	34.484	100	1,173	0.98
M327	OFFICE	25.740	74	1,979	0.43
M401	OFFICE	6.184	17	1,173	0.17
M402	OFFICE	5.939	17	1,173	0.16
M403	OFFICE	2.248	6	1,576	0.04
M405	OFFICE	5.451	15	1,173	0.15
M406	OFFICE	0.664	2	1,173	0.02
M407	OFFICE	5.841	16	1,576	0.12
M408	OFFICE	7.502	21	1,173	0.21
M409	OFFICE	2.929	8	1,576	0.06
M411	OFFICE	0.815	2	1,173	0.02
M412	OFFICE	0.734	2	1,173	0.02
M413	OFFICE	1.938	6	1,173	0.05
M414	OFFICE	6.183	17	1,173	0.17
M415	OCC. WAREHOUSE	5.709	16	1,173	0.16
M416	OFFICE	2.941	8	1,576	0.06
M418	OFFICE	6.474	18	1,576	0.13
M419	OFFICE	5.595	16	1,173	0.15
M420	OFFICE	2.944	8	1,576	0.06
M422	OFFICE	2.906	8	1,576	0.06
M424	OFFICE	39.558	116	1,173	1.14
M441	OFFICE	12.640	43	1,173	0.42
M501	OCC. WAREHOUSE	4.624	13	1,173	0.13
M502	OFFICE	7.615	22	1,173	0.21
M503	OFFICE	3.323	9	1,576	0.07
M504	OFFICE	2.654	7	1,576	0.05
M506	OCC. WAREHOUSE	5.773	16	1,173	0.16
M507	OFFICE	2.754	8	1,576	0.05
M509	OFFICE	2.466	7	1,576	0.05
M511	OFFICE	1.422	4	1,173	0.04
M512	OCC. WAREHOUSE	6.052	17	1,173	0.17
M513	OFFICE	7.935	23	1,173	0.22
M514	OFFICE	2.439	7	1,576	0.05
M516	OFFICE	2.214	6	5,606	0.01
M518	OFFICE	2.669	7	1,576	0.05
M520	OFFICE	5.303	15	1,173	0.15
M521	OFFICE	3.871	11	1,576	0.08
M522	OFFICE	3.061	8	1,576	0.06
M601	OFFICE	7.531	21	1,173	0.21
M602	OFFICE	4.541	13	1,173	0.12
M603	OFFICE	6.102	17	1,173	0.17

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CAMP JOHNSON
OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M604	OFFICE	2.317	6	1,576	0.04
M606	OCC. WAREHOUSE	8.238	23	1,173	0.23
M607	OFFICE	2.308	6	1,576	0.04
M609	OFFICE	2.803	8	1,576	0.05
M611	OFFICE	3.679	10	1,576	0.07
M612	OFFICE	6.661	19	1,173	0.18
M613	OFFICE	7.341	21	1,173	0.20
M614	OFFICE	2.700	7	1,576	0.05
M616	OFFICE	2.207	6	1,576	0.04
M619	OFFICE	6.598	19	1,173	0.18
M620	OFFICE	6.482	18	1,173	0.18
M621	OFFICE	3.345	9	1,576	0.07
M622	OFFICE	2.785	8	1,576	0.05

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COURTHOUSE BAY

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BB2	OFFICE	1.832	5	1,173	0.05
BB5	OFFICE	27.500	80	1,173	0.78
BB8	OFFICE	9.357	27	1,173	0.26
BB10	OFFICE	17.235	50	1,173	0.49
BB11	OFFICE	60.928	177	6,815	0.29
BB12	OFFICE	61.347	178	7,218	0.28
BB13	OFFICE	60.543	176	7,218	0.28
BB14	OFFICE	60.674	176	6,815	0.29
BB15	OFFICE	11.935	34	1,173	0.34
BB16	OFFICE	8.502	24	1,173	0.24
BB27	OFFICE	12.861	37	1,173	0.36
BB28	OFFICE	22.150	64	1,173	0.63
BB45	OFFICE	2.316	7	1,173	0.07
BB50	OFFICE	3.790	12	1,173	0.11
BB51	OCC. WAREHOUSE	33.077	96	1,173	0.94
BB52	OFFICE	22.920	66	1,173	0.65
BB54	OFFICE	17.852	51	1,173	0.50
BB72	OFFICE	3.990	11	1,173	0.11
BB269	OFFICE	4.235	14	1,173	0.13

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CAMP GEIGER

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
G770	HOSPITAL	2.969	9	1,173	0.09
TC701	OFFICE	10.875	32	1,173	0.31
TC704	OFFICE	5.432	15	1,576	0.11
TC705	OFFICE	5.432	15	1,576	0.11
TC706	OFFICE	5.432	15	1,576	0.11
TC707	OFFICE	5.432	15	1,576	0.11
TC708	OFFICE	5.432	15	1,576	0.11
TC709	OFFICE	4.214	12	1,576	0.08
TC710	OFFICE	3.603	10	1,576	0.07
TC711	OFFICE	3.603	10	1,576	0.07
TC712	OFFICE	3.603	10	1,576	0.07
TC714	OFFICE	3.603	10	1,576	0.07
TC715	OFFICE	3.603	10	1,576	0.07
TC716	OFFICE	5.432	15	1,576	0.11
TC717	OFFICE	5.432	15	1,576	0.11
TC718	OFFICE	5.432	15	1,576	0.11
TC719	OFFICE	5.432	15	1,576	0.11
TC726	OFFICE	5.432	15	1,576	0.11
TC727	OFFICE	5.432	15	1,576	0.11
TC728	OFFICE	5.432	15	1,576	0.11
TC729	OFFICE	5.432	15	1,576	0.11
TC735	OFFICE	4.942	14	1,173	0.14
TC736	OFFICE	5.432	15	1,576	0.11
TC737	OFFICE	5.432	15	1,576	0.11
TC738	OFFICE	5.432	15	1,576	0.11
TC739	OFFICE	5.432	15	1,576	0.11
TC740	OFFICE	3.603	10	1,576	0.07
TC741	OFFICE	3.603	10	1,576	0.07
TC742	OFFICE	3.603	10	1,576	0.07
TC743	OFFICE	3.603	10	1,576	0.07
TC744	OFFICE	3.603	10	1,576	0.07
TC745	OFFICE	5.432	15	1,576	0.11
TC748	OFFICE	5.432	15	1,576	0.11
TC749	OFFICE	5.432	15	1,576	0.11
TC750	OFFICE	5.432	15	1,576	0.11
TC751	OFFICE	5.432	15	1,576	0.11
TC752	OFFICE	5.432	15	1,576	0.11
TC753	OFFICE	5.432	15	1,576	0.11
TC754	OFFICE	5.432	15	1,576	0.11
TC804	OFFICE	5.432	15	1,576	0.11
TC805	OFFICE	5.432	15	1,576	0.11
TC806	OFFICE	5.432	15	1,576	0.11
TC807	OFFICE	5.432	15	1,576	0.11
TC808	OFFICE	5.432	15	1,576	0.11
TC809	OFFICE	5.432	15	1,576	0.11
TC810	OFFICE	3.603	10	1,576	0.07

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CAMP GEIGER

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC812	OFFICE	3.603	10	1,576	0.07
TC814	OFFICE	3.603	10	1,576	0.07
TC815	OFFICE	3.603	10	1,576	0.07
TC816	OFFICE	5.432	15	1,576	0.11
TC817	OFFICE	5.432	15	1,576	0.11
TC818	OFFICE	5.432	15	1,576	0.11
TC819	OFFICE	5.432	15	1,576	0.11
TC826	OFFICE	5.432	15	1,576	0.11
TC827	OFFICE	5.432	15	1,576	0.11
TC828	OFFICE	5.432	15	1,576	0.11
TC829	OFFICE	5.432	15	1,576	0.11
TC832	OFFICE	4.942	14	1,173	0.14
TC834	OFFICE	4.942	14	1,173	0.14
TC836	OFFICE	5.432	15	1,576	0.11
TC837	OFFICE	5.432	15	1,576	0.11
TC838	OFFICE	5.432	15	1,576	0.11
TC839	OFFICE	5.432	15	1,576	0.11
TC840	OFFICE	3.603	10	1,576	0.07
TC841	OFFICE	3.603	10	1,576	0.07
TC842	OFFICE	3.603	10	1,576	0.07
TC844	OFFICE	3.603	10	1,576	0.07
TC845	OFFICE	3.603	10	1,576	0.07
TC846	OFFICE	8.371	24	1,173	0.23
TC848	OFFICE	5.432	15	1,576	0.11
TC850	OFFICE	1.554	4	1,576	0.03
TC851	OFFICE	1.554	4	1,576	0.03
TC853	OFFICE	5.432	15	1,576	0.11
TC854	OFFICE	5.432	15	1,576	0.11
TC855	OFFICE	36.895	107	1,576	0.78
TC900	OFFICE	0.000	0	1,173	0.00
TC910	OFFICE	57.031	165	1,979	0.96
TC950	OFFICE	1.554	4	1,576	0.03
TC951	OFFICE	5.432	15	1,576	0.11
TC1003	OFFICE	5.432	15	1,576	0.11
TC1004	OFFICE	5.432	15	1,576	0.11
TC1005	OFFICE	5.432	15	1,576	0.11
TC1006	OFFICE	5.432	15	1,576	0.11
TC1007	OFFICE	5.432	15	1,576	0.11
TC1008	OFFICE	5.432	15	1,576	0.11
TC1009	OFFICE	5.432	15	1,576	0.11
TC1010	OFFICE	3.603	10	1,576	0.07
TC1012	OFFICE	3.603	10	1,576	0.07
TC1013	OFFICE	3.603	10	1,576	0.07
TC1015	OFFICE	3.603	10	1,576	0.07
TC1016	OFFICE	3.603	10	1,576	0.07
TC1017	OFFICE	5.432	15	1,576	0.11

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CAMP GEIGER

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1018	OFFICE	5.432	15	1,576	0.11
TC1019	OFFICE	5.432	15	1,576	0.11
TC1026	OFFICE	5.432	15	1,576	0.11
TC1027	OFFICE	5.432	15	1,576	0.11
TC1028	OFFICE	5.432	15	1,576	0.11
TC1029	OFFICE	5.432	15	1,576	0.11
TC1036	OFFICE	5.432	15	1,576	0.11
TC1037	OFFICE	5.432	15	1,576	0.11
TC1038	OFFICE	5.432	15	1,576	0.11
TC1039	OFFICE	5.432	15	1,576	0.11
TC1040	OFFICE	3.603	10	1,576	0.07
TC1041	OFFICE	3.603	10	1,576	0.07
TC1042	OFFICE	3.603	10	1,576	0.07
TC1044	OFFICE	3.603	10	1,576	0.07
TC1045	OFFICE	3.603	10	1,576	0.07
TC1046	OFFICE	5.432	15	1,576	0.11
TC1047	OFFICE	5.432	15	1,576	0.11
TC1048	OFFICE	5.432	15	1,576	0.11
TC1049	OFFICE	5.432	15	1,576	0.11
TC1050	OFFICE	1.554	4	1,576	0.03
TC1051	OFFICE	1.554	4	1,576	0.03
TC1052	OFFICE	1.554	4	1,576	0.03
TC1053	OFFICE	1.554	4	1,576	0.03
TC1054	OFFICE	1.554	4	1,576	0.03
TC1055	OFFICE	5.432	15	1,576	0.11
TC1056	OFFICE	5.432	15	1,576	0.11
TC1057	OFFICE	5.432	15	1,576	0.11
TC1058	OFFICE	5.432	15	1,576	0.11
TC1059	OFFICE	5.432	15	1,576	0.11
TC1060	OFFICE	5.432	15	1,576	0.11
TC1061	OFFICE	5.432	15	1,576	0.11
TC1062	OFFICE	5.432	15	1,576	0.11
TC1063	OFFICE	5.432	15	1,576	0.11
TC1064	OFFICE	5.432	15	1,576	0.11
TC1065	OFFICE	5.432	15	1,576	0.11
TC1066	OFFICE	5.432	15	1,576	0.11
TC1067	OFFICE	5.432	15	1,576	0.11
TC1068	OFFICE	5.432	15	1,576	0.11
TC1069	OFFICE	5.432	15	1,576	0.11
TC1110	OFFICE	5.432	15	1,576	0.11
TC1119	OFFICE	5.432	15	1,576	0.11
TC1131	OFFICE	5.432	15	1,576	0.11
TC1132	OFFICE	5.432	15	1,576	0.11
TC1140	OFFICE	3.603	10	1,576	0.07
TC1141	OFFICE	3.603	10	1,576	0.07
TC1142	OFFICE	5.432	15	1,576	0.11

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CAMP GEIGER

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1143	OFFICE	5.432	15	1,576	0.11
TC1160	OFFICE	5.432	15	1,576	0.11
TC1161	OFFICE	5.432	15	1,576	0.11
TC1162	OFFICE	5.432	15	1,576	0.11

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PARADISE POINT

OUTSIDE AIR LIMIT SHUTOFF:

BUILDING NO.	STRUCTURE TYPE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
2600	OFFICE	12.558	36	1,173	0.35
2603	OFFICE	20.285	59	4,800	0.14
2624	OFFICE	25.599	74	1,173	0.72
2625	OFFICE	11.668	33	1,173	0.33
2626	OFFICE	8.239	23	1,173	0.23
2627	OFFICE	12.417	36	1,173	0.35
2628	OFFICE	10.681	31	1,173	0.30
2629	OCC. WAREHOUSE	6.821	19	1,173	0.19

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4.6 HOT WATER OUTSIDE AIR RESET

Introduction - The ECO discusses energy and cost savings which would be realized by installing outside air reset controls on existing building hot water heating systems. These controls would be stand-alone controls which are compatible with the existing Energy Management Control System (EMCS) which is controlled by a Hewlett Packard (HP) 1000 computer.

Existing Condition - Many buildings at this installation which are heated with hot water are provided with hot water at a temperature required only during the most extreme weather conditions. Hot water outside air reset controls change the hot water temperature supplied to the building to match the actual heating load. The typical control package consists of an outside air temperature sensor, a hot water supply temperature sensor and a temperature controller. At the coldest times of the year, the temperature control valve will maintain the design hot water supply temperature. However, as outside air temperature rises, the temperature controller will begin to modulate, reducing the hot water supply temperature provided to the building. Since hot water distribution losses within the heating system are directly dependent on the hot water supply temperature, these losses will be reduced during mild outside air temperatures.

Calculation Methodology - Following is the methodology used to calculate energy savings from hot water outside air reset control systems.

Reference: CR 82.030 "Standardized EMCS Energy Savings Calculations" pg. 56

Energy Savings =

(HFLH x EI x Cap./HEFF) x 1 MBtu/1x106x 1/Plant Eff.

Where:

Energy Savings = Rate of heat transfer from the building boundary in MBtu/yr

Cap = Maximum capacity of devices in Btu/hr (see below).

EI = Efficiency increase expressed as a decimal, use 0.01 per REFERENCE)

HEFF = Heating efficiency of the system (use 0.90 per REFERENCE)

Plant Eff. = Efficiency of the steam generating plant (See Section 3.2" Fuel Costs and Efficiencies).

Cap =

BTT x AZ x (Td - To)

Where:

BTT = Building thermal transmission in Btu/hr.- deg. F sq. ft. (See Section 4.4., "Night Setback")

AZ = Area of zone being served in sq. ft.

To = Design outdoor temperature = 23 deg. F

Td = Indoor design temperature (See Section 3.3, "General Analysis Methods")

HFLH = Annual hours/yr below 65 deg. F / 65 deg. F - heating design temp.

REFERENCE: NAVFAC P-89 Engineering Weather Data

Mean deg. F In Range	Hrs of Occurrence	Degree hrs Hrs of Occur.x (65 deg-mean deg. F)
62	868	2604
57	752	6016
52	684	8892
47	636	11,448
42	578	13,294
37	425	11,900
32	302	9966
27	152	5776
22	51	2193
17	14	672
12	2	106
	4464	72,867 deg. F - hrs

$$HFLH = \frac{72,867}{65 - 23} = 1735 \text{ hrs/yr.}$$

Calculation Example:

Given: BTT = 0.597 Btu/sq. ft. - hr-deg. F

AZ = 3000 sq. ft.

Td = 65 deg. F

Plant Eff. = 0.73

Cap = 0.597 x 3000 x (65-23) = 75,222 Btu/hr

Energy Savings = (1735 x 0.01 x 55,222/0.9) x 1/1x106 x 1/0.73

= 1.39 MBtu/yr

Cost Estimate - The items and associated costs required to accomplish hot water outside air reset is as follows:

Steam/HW converter

Item	Materials	Labor	Total
Water temperature sensor	105	24	129
Thermowell	31	133	164
Outside air temperature sensor	119	17	136
Pneumatic valve controller	204	44	248
EP transducer	239	44	283

Total = $960/building

Summary - The following pages present individual building energy savings and cost estimates for all buildings.

The life-cycle cost analysis indicates that no building has a discounted savings to investment ratio (SIR) which exceeds 1.0 indicating that this ECO does not satisfy the criteria necessary to

be cost effective. However, this ECO can be incorporated with other control ECOs at a minimal cost and become a viable opportunity. See Section 4.7 "Combined Control ECO."

AIR STATION

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
AS114	OFFICE	ST	N/A	N/A	N/A	N/A
AS118	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
AS122	OFFICE	ST	N/A	N/A	N/A	N/A
AS124	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
AS130	OFFICE	ST	N/A	N/A	N/A	N/A
AS202	OFFICE	ST	N/A	N/A	N/A	N/A
AS205	OFFICE	ST	N/A	N/A	N/A	N/A
AS208	OFFICE	ST	N/A	N/A	N/A	N/A
AS215	OFFICE	ST	N/A	N/A	N/A	N/A
AS216	OFFICE	ST	N/A	N/A	N/A	N/A
AS217	OFFICE	ST	N/A	N/A	N/A	N/A
AS232	OFFICE	ST	N/A	N/A	N/A	N/A
AS236	OFFICE	ST	N/A	N/A	N/A	N/A
AS302	OFFICE	ST	N/A	N/A	N/A	N/A
AS312	OFFICE	HW	2.159	6	960	0.07
AS320	OFFICE	HW	2.387	6	960	0.08
AS414	OFFICE	ST	N/A	N/A	N/A	N/A
AS424	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
AS425	OFFICE	ST	N/A	N/A	N/A	N/A
AS502	OFFICE	ST	N/A	N/A	N/A	N/A
AS4012	OFFICE	HW	2.552	7	960	0.08
AS4030	OFFICE	HW	3.900	11	960	0.13
AS4035	OFFICE	HW	3.602	10	960	0.12
AS4110	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
AS4120	OFFICE	ST	N/A	N/A	N/A	N/A
AS4122	OFFICE	ST	N/A	N/A	N/A	N/A
AS4141	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
AS4145	OFFICE	ST	N/A	N/A	N/A	N/A
AS4146	OCC. WAREHOUSE	HW	3.185	9	960	0.11
AS4157	OFFICE	HW	1.550	4	960	0.05
AS4158	OCC. WAREHOUSE	HW	8.550	24	960	0.29

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BEACH AREA

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BA101	OFFICE	ST	N/A	N/A	N/A	N/A
BA102	OFFICE	ST	N/A	N/A	N/A	N/A
BA103	OFFICE	ST	N/A	N/A	N/A	N/A
BA104	OFFICE	ST	N/A	N/A	N/A	N/A
BA105	OFFICE	ST	N/A	N/A	N/A	N/A
BA128	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A

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CAMP GEIGER

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
G770	HOSPITAL	HW	2.586	7	960	0.09
TC701	OFFICE	HW	2.004	5	960	0.06
TC704	OFFICE	ST	N/A	N/A	N/A	N/A
TC705	OFFICE	ST	N/A	N/A	N/A	N/A
TC706	OFFICE	ST	N/A	N/A	N/A	N/A
TC707	OFFICE	ST	N/A	N/A	N/A	N/A
TC708	OFFICE	ST	N/A	N/A	N/A	N/A
TC709	OFFICE	ST	N/A	N/A	N/A	N/A
TC710	OFFICE	ST	N/A	N/A	N/A	N/A
TC711	OFFICE	ST	N/A	N/A	N/A	N/A
TC712	OFFICE	ST	N/A	N/A	N/A	N/A
TC714	OFFICE	ST	N/A	N/A	N/A	N/A
TC715	OFFICE	ST	N/A	N/A	N/A	N/A
TC716	OFFICE	ST	N/A	N/A	N/A	N/A
TC717	OFFICE	ST	N/A	N/A	N/A	N/A
TC718	OFFICE	ST	N/A	N/A	N/A	N/A
TC719	OFFICE	ST	N/A	N/A	N/A	N/A
TC726	OFFICE	ST	N/A	N/A	N/A	N/A
TC727	OFFICE	ST	N/A	N/A	N/A	N/A
TC728	OFFICE	ST	N/A	N/A	N/A	N/A
TC729	OFFICE	ST	N/A	N/A	N/A	N/A
TC735	OFFICE	ST	N/A	N/A	N/A	N/A
TC736	OFFICE	ST	N/A	N/A	N/A	N/A
TC737	OFFICE	ST	N/A	N/A	N/A	N/A
TC738	OFFICE	ST	N/A	N/A	N/A	N/A
TC739	OFFICE	ST	N/A	N/A	N/A	N/A
TC740	OFFICE	ST	N/A	N/A	N/A	N/A
TC741	OFFICE	ST	N/A	N/A	N/A	N/A
TC742	OFFICE	ST	N/A	N/A	N/A	N/A
TC743	OFFICE	ST	N/A	N/A	N/A	N/A
TC744	OFFICE	ST	N/A	N/A	N/A	N/A
TC745	OFFICE	ST	N/A	N/A	N/A	N/A
TC748	OFFICE	ST	N/A	N/A	N/A	N/A
TC749	OFFICE	ST	N/A	N/A	N/A	N/A
TC750	OFFICE	ST	N/A	N/A	N/A	N/A
TC751	OFFICE	ST	N/A	N/A	N/A	N/A
TC752	OFFICE	ST	N/A	N/A	N/A	N/A
TC753	OFFICE	ST	N/A	N/A	N/A	N/A
TC754	OFFICE	ST	N/A	N/A	N/A	N/A
TC804	OFFICE	ST	N/A	N/A	N/A	N/A
TC805	OFFICE	ST	N/A	N/A	N/A	N/A
TC806	OFFICE	ST	N/A	N/A	N/A	N/A
TC807	OFFICE	ST	N/A	N/A	N/A	N/A
TC808	OFFICE	ST	N/A	N/A	N/A	N/A
TC809	OFFICE	ST	N/A	N/A	N/A	N/A
TC810	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP GEIGER

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC812	OFFICE	ST	N/A	N/A	N/A	N/A
TC814	OFFICE	ST	N/A	N/A	N/A	N/A
TC815	OFFICE	ST	N/A	N/A	N/A	N/A
TC816	OFFICE	ST	N/A	N/A	N/A	N/A
TC817	OFFICE	ST	N/A	N/A	N/A	N/A
TC818	OFFICE	ST	N/A	N/A	N/A	N/A
TC819	OFFICE	ST	N/A	N/A	N/A	N/A
TC826	OFFICE	ST	N/A	N/A	N/A	N/A
TC827	OFFICE	ST	N/A	N/A	N/A	N/A
TC828	OFFICE	ST	N/A	N/A	N/A	N/A
TC829	OFFICE	ST	N/A	N/A	N/A	N/A
TC832	OFFICE	ST	N/A	N/A	N/A	N/A
TC834	OFFICE	ST	N/A	N/A	N/A	N/A
TC836	OFFICE	ST	N/A	N/A	N/A	N/A
TC837	OFFICE	ST	N/A	N/A	N/A	N/A
TC838	OFFICE	ST	N/A	N/A	N/A	N/A
TC839	OFFICE	ST	N/A	N/A	N/A	N/A
TC840	OFFICE	ST	N/A	N/A	N/A	N/A
TC841	OFFICE	ST	N/A	N/A	N/A	N/A
TC842	OFFICE	ST	N/A	N/A	N/A	N/A
TC844	OFFICE	ST	N/A	N/A	N/A	N/A
TC845	OFFICE	ST	N/A	N/A	N/A	N/A
TC846	OFFICE	ST	N/A	N/A	N/A	N/A
TC848	OFFICE	ST	N/A	N/A	N/A	N/A
TC850	OFFICE	ST	N/A	N/A	N/A	N/A
TC851	OFFICE	ST	N/A	N/A	N/A	N/A
TC853	OFFICE	ST	N/A	N/A	N/A	N/A
TC854	OFFICE	ST	N/A	N/A	N/A	N/A
TC855	OFFICE	ST	N/A	N/A	N/A	N/A
TC900	OFFICE	ST	N/A	N/A	N/A	N/A
TC910	OFFICE	ST	N/A	N/A	N/A	N/A
TC950	OFFICE	ST	N/A	N/A	N/A	N/A
TC951	OFFICE	ST	N/A	N/A	N/A	N/A
TC1003	OFFICE	ST	N/A	N/A	N/A	N/A
TC1004	OFFICE	ST	N/A	N/A	N/A	N/A
TC1005	OFFICE	ST	N/A	N/A	N/A	N/A
TC1006	OFFICE	ST	N/A	N/A	N/A	N/A
TC1007	OFFICE	ST	N/A	N/A	N/A	N/A
TC1008	OFFICE	ST	N/A	N/A	N/A	N/A
TC1009	OFFICE	ST	N/A	N/A	N/A	N/A
TC1010	OFFICE	ST	N/A	N/A	N/A	N/A
TC1012	OFFICE	ST	N/A	N/A	N/A	N/A
TC1013	OFFICE	ST	N/A	N/A	N/A	N/A
TC1015	OFFICE	ST	N/A	N/A	N/A	N/A
TC1016	OFFICE	ST	N/A	N/A	N/A	N/A
TC1017	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP GEIGER
HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1018	OFFICE	ST	N/A	N/A	N/A	N/A
TC1019	OFFICE	ST	N/A	N/A	N/A	N/A
TC1026	OFFICE	ST	N/A	N/A	N/A	N/A
TC1027	OFFICE	ST	N/A	N/A	N/A	N/A
TC1028	OFFICE	ST	N/A	N/A	N/A	N/A
TC1029	OFFICE	ST	N/A	N/A	N/A	N/A
TC1036	OFFICE	ST	N/A	N/A	N/A	N/A
TC1037	OFFICE	ST	N/A	N/A	N/A	N/A
TC1038	OFFICE	ST	N/A	N/A	N/A	N/A
TC1039	OFFICE	ST	N/A	N/A	N/A	N/A
TC1040	OFFICE	ST	N/A	N/A	N/A	N/A
TC1041	OFFICE	ST	N/A	N/A	N/A	N/A
TC1042	OFFICE	ST	N/A	N/A	N/A	N/A
TC1044	OFFICE	ST	N/A	N/A	N/A	N/A
TC1045	OFFICE	ST	N/A	N/A	N/A	N/A
TC1046	OFFICE	ST	N/A	N/A	N/A	N/A
TC1047	OFFICE	ST	N/A	N/A	N/A	N/A
TC1048	OFFICE	ST	N/A	N/A	N/A	N/A
TC1049	OFFICE	ST	N/A	N/A	N/A	N/A
TC1050	OFFICE	ST	N/A	N/A	N/A	N/A
TC1051	OFFICE	ST	N/A	N/A	N/A	N/A
TC1052	OFFICE	ST	N/A	N/A	N/A	N/A
TC1053	OFFICE	ST	N/A	N/A	N/A	N/A
TC1054	OFFICE	ST	N/A	N/A	N/A	N/A
TC1055	OFFICE	ST	N/A	N/A	N/A	N/A
TC1056	OFFICE	ST	N/A	N/A	N/A	N/A
TC1057	OFFICE	ST	N/A	N/A	N/A	N/A
TC1058	OFFICE	ST	N/A	N/A	N/A	N/A
TC1059	OFFICE	ST	N/A	N/A	N/A	N/A
TC1060	OFFICE	ST	N/A	N/A	N/A	N/A
TC1061	OFFICE	ST	N/A	N/A	N/A	N/A
TC1062	OFFICE	ST	N/A	N/A	N/A	N/A
TC1063	OFFICE	ST	N/A	N/A	N/A	N/A
TC1064	OFFICE	ST	N/A	N/A	N/A	N/A
TC1065	OFFICE	ST	N/A	N/A	N/A	N/A
TC1066	OFFICE	ST	N/A	N/A	N/A	N/A
TC1067	OFFICE	ST	N/A	N/A	N/A	N/A
TC1068	OFFICE	ST	N/A	N/A	N/A	N/A
TC1069	OFFICE	ST	N/A	N/A	N/A	N/A
TC1110	OFFICE	ST	N/A	N/A	N/A	N/A
TC1119	OFFICE	ST	N/A	N/A	N/A	N/A
TC1131	OFFICE	ST	N/A	N/A	N/A	N/A
TC1132	OFFICE	ST	N/A	N/A	N/A	N/A
TC1140	OFFICE	ST	N/A	N/A	N/A	N/A
TC1141	OFFICE	ST	N/A	N/A	N/A	N/A
TC1142	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP GEIGER

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
TC1143	OFFICE	ST	N/A	N/A	N/A	N/A
TC1160	OFFICE	ST	N/A	N/A	N/A	N/A
TC1161	OFFICE	ST	N/A	N/A	N/A	N/A
TC1162	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP JOHNSON

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M90	OFFICE	ST	N/A	N/A	N/A	N/A
M100	OFFICE	ST	N/A	N/A	N/A	N/A
M101	OFFICE	ST	N/A	N/A	N/A	N/A
M102	OFFICE	ST	N/A	N/A	N/A	N/A
M103	OFFICE	ST	N/A	N/A	N/A	N/A
M104	OFFICE	ST	N/A	N/A	N/A	N/A
M105	OFFICE	ST	N/A	N/A	N/A	N/A
M112	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M116	OFFICE	HW	1.595	4	960	0.05
M123	OFFICE	ST	N/A	N/A	N/A	N/A
M124	OFFICE	ST	N/A	N/A	N/A	N/A
M125	OFFICE	ST	N/A	N/A	N/A	N/A
M126	OFFICE	ST	N/A	N/A	N/A	N/A
M127	OFFICE	ST	N/A	N/A	N/A	N/A
M128	OFFICE	HW	3.651	10	960	0.12
M129	OFFICE	ST	N/A	N/A	N/A	N/A
M130	OFFICE	HW	2.104	6	960	0.07
M131	OFFICE	HW	2.382	6	960	0.08
M132	OFFICE	ST	N/A	N/A	N/A	N/A
M134	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M178	OFFICE	ST	N/A	N/A	N/A	N/A
M201	OFFICE	ST	N/A	N/A	N/A	N/A
M202	OFFICE	ST	N/A	N/A	N/A	N/A
M205	OFFICE	ST	N/A	N/A	N/A	N/A
M206	OFFICE	ST	N/A	N/A	N/A	N/A
M207	OFFICE	ST	N/A	N/A	N/A	N/A
M208	OFFICE	ST	N/A	N/A	N/A	N/A
M209	OFFICE	ST	N/A	N/A	N/A	N/A
M210	OFFICE	ST	N/A	N/A	N/A	N/A
M215	OFFICE	ST	N/A	N/A	N/A	N/A
M216	OFFICE	ST	N/A	N/A	N/A	N/A
M231	OFFICE	ST	N/A	N/A	N/A	N/A
M237	OFFICE	HW	0.365	1	960	0.01
M240	OFFICE	ST	N/A	N/A	N/A	N/A
M301	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M302	OFFICE	ST	N/A	N/A	N/A	N/A
M303	OFFICE	ST	N/A	N/A	N/A	N/A
M305	OFFICE	ST	N/A	N/A	N/A	N/A
M307	OFFICE	ST	N/A	N/A	N/A	N/A
M308	OFFICE	ST	N/A	N/A	N/A	N/A
M309	OFFICE	ST	N/A	N/A	N/A	N/A
M311	OFFICE	ST	N/A	N/A	N/A	N/A
M313	OFFICE	ST	N/A	N/A	N/A	N/A
M314	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M315	OFFICE	ST	N/A	N/A	N/A	N/A
M316	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP JOHNSON

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M318	OFFICE	ST	N/A	N/A	N/A	N/A
M319	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M321	OFFICE	ST	N/A	N/A	N/A	N/A
M323	OFFICE	ST	N/A	N/A	N/A	N/A
M324	OFFICE	ST	N/A	N/A	N/A	N/A
M326	OFFICE	ST	N/A	N/A	N/A	N/A
M327	OFFICE	ST	N/A	N/A	N/A	N/A
M401	OFFICE	ST	N/A	N/A	N/A	N/A
M402	OFFICE	ST	N/A	N/A	N/A	N/A
M403	OFFICE	ST	N/A	N/A	N/A	N/A
M405	OFFICE	ST	N/A	N/A	N/A	N/A
M406	OFFICE	HW	1.163	3	960	0.04
M407	OFFICE	ST	N/A	N/A	N/A	N/A
M408	OFFICE	ST	N/A	N/A	N/A	N/A
M409	OFFICE	ST	N/A	N/A	N/A	N/A
M411	OFFICE	HW	1.163	3	960	0.04
M412	OFFICE	HW	1.163	3	960	0.04
M413	OFFICE	HW	1.110	3	960	0.03
M414	OFFICE	ST	N/A	N/A	N/A	N/A
M415	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M416	OFFICE	ST	N/A	N/A	N/A	N/A
M418	OFFICE	ST	N/A	N/A	N/A	N/A
M419	OFFICE	ST	N/A	N/A	N/A	N/A
M420	OFFICE	ST	N/A	N/A	N/A	N/A
M422	OFFICE	ST	N/A	N/A	N/A	N/A
M424	OFFICE	HW	4.830	14	960	0.16
M441	OFFICE	HW	18.247	53	960	0.63
M501	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M502	OFFICE	ST	N/A	N/A	N/A	N/A
M503	OFFICE	ST	N/A	N/A	N/A	N/A
M504	OFFICE	ST	N/A	N/A	N/A	N/A
M506	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M507	OFFICE	ST	N/A	N/A	N/A	N/A
M509	OFFICE	ST	N/A	N/A	N/A	N/A
M511	OFFICE	HW	1.490	4	960	0.05
M512	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M513	OFFICE	ST	N/A	N/A	N/A	N/A
M514	OFFICE	ST	N/A	N/A	N/A	N/A
M516	OFFICE	ST	N/A	N/A	N/A	N/A
M518	OFFICE	ST	N/A	N/A	N/A	N/A
M520	OFFICE	ST	N/A	N/A	N/A	N/A
M521	OFFICE	ST	N/A	N/A	N/A	N/A
M522	OFFICE	ST	N/A	N/A	N/A	N/A
M601	OFFICE	ST	N/A	N/A	N/A	N/A
M602	OFFICE	ST	N/A	N/A	N/A	N/A
M603	OFFICE	ST	N/A	N/A	N/A	N/A

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CAMP JOHNSON

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
M604	OFFICE	ST	N/A	N/A	N/A	N/A
M606	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
M607	OFFICE	ST	N/A	N/A	N/A	N/A
M609	OFFICE	ST	N/A	N/A	N/A	N/A
M611	OFFICE	ST	N/A	N/A	N/A	N/A
M612	OFFICE	ST	N/A	N/A	N/A	N/A
M613	OFFICE	ST	N/A	N/A	N/A	N/A
M614	OFFICE	ST	N/A	N/A	N/A	N/A
M616	OFFICE	ST	N/A	N/A	N/A	N/A
M619	OFFICE	ST	N/A	N/A	N/A	N/A
M620	OFFICE	ST	N/A	N/A	N/A	N/A
M621	OFFICE	ST	N/A	N/A	N/A	N/A
M622	OFFICE	ST	N/A	N/A	N/A	N/A

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COURTHOUSE BAY

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BB2	OFFICE	HW	1.408	4	960	0.04
BB5	OFFICE	ST	N/A	N/A	N/A	N/A
BB8	OFFICE	ST	N/A	N/A	N/A	N/A
BB10	OFFICE	ST	N/A	N/A	N/A	N/A
BB11	OFFICE	ST	N/A	N/A	N/A	N/A
BB12	OFFICE	ST	N/A	N/A	N/A	N/A
BB13	OFFICE	ST	N/A	N/A	N/A	N/A
BB14	OFFICE	ST	N/A	N/A	N/A	N/A
BB15	OFFICE	ST	N/A	N/A	N/A	N/A
BB16	OFFICE	ST	N/A	N/A	N/A	N/A
BB27	OFFICE	ST	N/A	N/A	N/A	N/A
BB28	OFFICE	ST	N/A	N/A	N/A	N/A
BB45	OFFICE	HW	2.898	8	960	0.10
BB50	OFFICE	HW	3.030	8	960	0.10
BB51	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
BB52	OFFICE	ST	N/A	N/A	N/A	N/A
BB54	OFFICE	ST	N/A	N/A	N/A	N/A
BB72	OFFICE	ST	N/A	N/A	N/A	N/A
BB269	OFFICE	HW	5.026	14	960	0.17

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FRENCH CREEK
HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
FC100	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
FC190	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
FC200	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
FC241	OCC. WAREHOUSE	HW	4.044	9	960	0.09
FC251	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
FC301	OFFICE	ST	N/A	N/A	N/A	N/A
FC302	OFFICE	ST	N/A	N/A	N/A	N/A
FC303	OFFICE	HW	3.831	8	960	0.09
FC312	OFFICE	ST	N/A	N/A	N/A	N/A
FC313	OFFICE	HW	1.011	2	960	0.02
FC364	OFFICE	HW	1.604	3	960	0.03
FC573	OFFICE	HW	4.652	10	960	0.10

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HADNOT POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1	OFFICE	ST	N/A	N/A	N/A	N/A
2	OFFICE	ST	N/A	N/A	N/A	N/A
4	OFFICE	ST	N/A	N/A	N/A	N/A
6	OFFICE	ST	N/A	N/A	N/A	N/A
8	OFFICE	ST	N/A	N/A	N/A	N/A
11	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
13	OFFICE	ST	N/A	N/A	N/A	N/A
14	OFFICE	HW	2.532	5	960	0.05
15	OFFICE	HW	5.271	11	960	0.12
16	OFFICE	ST	N/A	N/A	N/A	N/A
17	OFFICE	ST	N/A	N/A	N/A	N/A
18	OFFICE	ST	N/A	N/A	N/A	N/A
25	OFFICE	ST	N/A	N/A	N/A	N/A
27	OFFICE	ST	N/A	N/A	N/A	N/A
41	OFFICE	HW	1.302	2	960	0.03
43	OFFICE	ST	N/A	N/A	N/A	N/A
50	OFFICE	HW	1.155	2	960	0.02
54	OFFICE	ST	N/A	N/A	N/A	N/A
58	OFFICE	ST	N/A	N/A	N/A	N/A
59	OFFICE	ST	N/A	N/A	N/A	N/A
63	OFFICE	ST	N/A	N/A	N/A	N/A
65	OFFICE	ST	N/A	N/A	N/A	N/A
66	OFFICE	HW	3.654	8	960	0.08
67	OFFICE	HW	4.599	10	960	0.10
84	OFFICE	ST	N/A	N/A	N/A	N/A
102	OFFICE	ST	N/A	N/A	N/A	N/A
106	OFFICE	ST	N/A	N/A	N/A	N/A
107	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
114	OFFICE	ST	N/A	N/A	N/A	N/A
115	OFFICE	ST	N/A	N/A	N/A	N/A
117	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
119	OFFICE	ST	N/A	N/A	N/A	N/A
123	OFFICE	ST	N/A	N/A	N/A	N/A
127	OFFICE	ST	N/A	N/A	N/A	N/A
201	OFFICE	ST	N/A	N/A	N/A	N/A
203	OFFICE	ST	N/A	N/A	N/A	N/A
206	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
214	OFFICE	ST	N/A	N/A	N/A	N/A
216	OFFICE	ST	N/A	N/A	N/A	N/A
219	OFFICE	ST	N/A	N/A	N/A	N/A
221	OFFICE	HW	0.865	1	960	0.02
223	OFFICE	ST	N/A	N/A	N/A	N/A
226	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
233	OFFICE	ST	N/A	N/A	N/A	N/A
300	OFFICE	ST	N/A	N/A	N/A	N/A
302	OFFICE	ST	N/A	N/A	N/A	N/A

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HADNOT POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
304	OFFICE	ST	N/A	N/A	N/A	N/A
307	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
314	OFFICE	ST	N/A	N/A	N/A	N/A
315	OFFICE	ST	N/A	N/A	N/A	N/A
317	OFFICE	ST	N/A	N/A	N/A	N/A
320	OFFICE	ST	N/A	N/A	N/A	N/A
400	OFFICE	ST	N/A	N/A	N/A	N/A
401	OFFICE	ST	N/A	N/A	N/A	N/A
403	OFFICE	ST	N/A	N/A	N/A	N/A
408	OFFICE	ST	N/A	N/A	N/A	N/A
412	OFFICE	ST	N/A	N/A	N/A	N/A
416	OFFICE	ST	N/A	N/A	N/A	N/A
417	OFFICE	ST	N/A	N/A	N/A	N/A
419	OFFICE	ST	N/A	N/A	N/A	N/A
420	OFFICE	ST	N/A	N/A	N/A	N/A
422	OFFICE	ST	N/A	N/A	N/A	N/A
423	OFFICE	ST	N/A	N/A	N/A	N/A
424	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
500	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
501	OFFICE	ST	N/A	N/A	N/A	N/A
502	OFFICE	ST	N/A	N/A	N/A	N/A
508	OFFICE	HW	3.620	8	960	0.08
509	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
516	OFFICE	ST	N/A	N/A	N/A	N/A
518	OFFICE	ST	N/A	N/A	N/A	N/A
520	OFFICE	ST	N/A	N/A	N/A	N/A
526	OFFICE	ST	N/A	N/A	N/A	N/A
751	OFFICE	ST	N/A	N/A	N/A	N/A
898	OFFICE	HW	3.401	7	960	0.08
900	OFFICE	ST	N/A	N/A	N/A	N/A
901	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
902	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
904	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
905	OFFICE	ST	N/A	N/A	N/A	N/A
907	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
908	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
909	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
910	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
914	OFFICE	ST	N/A	N/A	N/A	N/A
915	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
916	OCC. WAREHOUSE	HW	20.683	46	960	0.48
1002	OFFICE	ST	N/A	N/A	N/A	N/A
1004	UNOCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1005	OFFICE	HW	4.746	10	960	0.11
1006	OFFICE	HW	1.276	2	960	0.03
1011	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A

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HADNOT POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1012	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1015	OCC. WAREHOUSE	HW	3.737	8	960	0.08
1041	OFFICE	ST	N/A	N/A	N/A	N/A
1100	OFFICE	ST	N/A	N/A	N/A	N/A
1101	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1103	OFFICE	ST	N/A	N/A	N/A	N/A
1104	OFFICE	ST	N/A	N/A	N/A	N/A
1105	OFFICE	ST	N/A	N/A	N/A	N/A
1106	OFFICE	ST	N/A	N/A	N/A	N/A
1107	OFFICE	ST	N/A	N/A	N/A	N/A
1108	OFFICE	ST	N/A	N/A	N/A	N/A
1111	OFFICE	ST	N/A	N/A	N/A	N/A
1114	UNOCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1115	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1116	OCC. WAREHOUSE	HW	24.390	54	960	0.57
1117	OCC. WAREHOUSE	HW	22.166	49	960	0.52
1118	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1120	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1200	OFFICE	ST	N/A	N/A	N/A	N/A
1201	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1202	OFFICE	ST	N/A	N/A	N/A	N/A
1207	OFFICE	ST	N/A	N/A	N/A	N/A
1208	OFFICE	ST	N/A	N/A	N/A	N/A
1209	OFFICE	HW	3.497	7	960	0.08
1211	OFFICE	ST	N/A	N/A	N/A	N/A
1212	OCC. WAREHOUSE	HW	24.390	54	960	0.57
1220	OFFICE	ST	N/A	N/A	N/A	N/A
1301	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1302	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1304	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1309	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1310	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1316	OCC. WAREHOUSE	HW	22.166	49	960	0.52
1317	OCC. WAREHOUSE	HW	22.166	49	960	0.52
1400	OFFICE	ST	N/A	N/A	N/A	N/A
1401	OFFICE	ST	N/A	N/A	N/A	N/A
1403	OFFICE	ST	N/A	N/A	N/A	N/A
1404	OFFICE	ST	N/A	N/A	N/A	N/A
1407	OFFICE	ST	N/A	N/A	N/A	N/A
1409	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1410	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1450	OCC. WAREHOUSE	HW	7.772	17	960	0.18
1500	OFFICE	ST	N/A	N/A	N/A	N/A
1502	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1601	OFFICE	ST	N/A	N/A	N/A	N/A
1606	OFFICE	ST	N/A	N/A	N/A	N/A

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HADNOT POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
1607	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1610	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1611	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1612	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1613	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1706	UNOCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1707	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1750	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1755	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
1771	OCC. WAREHOUSE	HW	6.803	15	960	0.16
1775	OCC. WAREHOUSE	HW	21.380	47	960	0.50
1780	OCC. WAREHOUSE	HW	7.987	17	960	0.18
HP255	OFFICE	HW	5.026	11	960	0.11
HP265	OFFICE	HW	5.026	11	960	0.11
HP275	OFFICE	HW	5.026	11	960	0.11
HP285	OFFICE	HW	5.026	11	960	0.11
HP295	OFFICE	HW	5.026	11	960	0.11
HP405	OFFICE	HW	5.026	11	960	0.11
HP1016	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A

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HOSPITAL POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
H14	OFFICE	HW	4.264	9	960	0.10
H15A	OFFICE	ST	N/A	N/A	N/A	N/A
H16	OFFICE	HW	1.332	2	960	0.03
H17	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
H17N	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
H18	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
H19	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
H21	OFFICE	ST	N/A	N/A	N/A	N/A
H23	OFFICE	HW	6.055	13	960	0.14
H24	OFFICE	HW	6.055	13	960	0.14
H36	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A
H39	OFFICE	HW	0.434	0	960	0.01

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PARADISE POINT

HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
2600	OFFICE	ST	N/A	N/A	N/A	N/A
2603	OFFICE	ST	N/A	N/A	N/A	N/A
2624	OFFICE	ST	N/A	N/A	N/A	N/A
2625	OFFICE	ST	N/A	N/A	N/A	N/A
2626	OFFICE	ST	N/A	N/A	N/A	N/A
2627	OFFICE	ST	N/A	N/A	N/A	N/A
2628	OFFICE	ST	N/A	N/A	N/A	N/A
2629	OCC. WAREHOUSE	ST	N/A	N/A	N/A	N/A

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RIFLE RANGE
HOT WATER OUTSIDE AIR RESET:

BUILDING NO.	STRUCTURE TYPE	HEAT SOURCE	ENERGY SAVINGS MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
RR1	OFFICE	ST	N/A	N/A	N/A	N/A
RR2	OFFICE	ST	N/A	N/A	N/A	N/A
RR3	OFFICE	ST	N/A	N/A	N/A	N/A
RR4	OFFICE	ST	N/A	N/A	N/A	N/A
RR5	OFFICE	ST	N/A	N/A	N/A	N/A
RR8	OFFICE	ST	N/A	N/A	N/A	N/A
RR9	OFFICE	ST	N/A	N/A	N/A	N/A
RR10	OFFICE	ST	N/A	N/A	N/A	N/A
RR11	OFFICE	ST	N/A	N/A	N/A	N/A
RR12	OFFICE	ST	N/A	N/A	N/A	N/A

DATE: 06/22/87

SHEET 1 OF 1

4.7 COMBINED CONTROL ECO

Introduction - This ECO discusses energy and cost savings which would be realized by installing night setback, outside air limit shutoff, and hot water outside air reset controls in many of the buildings at this installation.

Existing Condition - The existing conditions for these controls to be a viable opportunity are as discussed in Sections 4.4 through 4.6. The cost of combining the three control systems does not exceed the cost of a single control system by a large amount due to the duplication of equipment required. Therefore, if one of the three opportunities was not economically justifiable, but the other two were, this opportunity could be incorporated with the other two for a minimal or no extra cost, increasing the SIR.

Calculation Methodology - The individual energy savings methodologies have been presented in Sections 4.4 through 4.6. To analyze the three as one opportunity, the interactive effects have to be considered to avoid taking credit for the same energy savings twice. Night Setback does not interact with Outside Air Limit Shutoff because Night Setback is applicable only when the outside temperature is below 65 deg. F while Outside Air Limit Shutoff is applicable only when the outside air temperature is above 65 deg. F. Therefore, no duplication of energy savings occurs. Hot Water Outside Air Reset does interact with the other two control opportunities. Since the energy savings resulting from Hot Water Outside Air Reset is based upon a reduced radiation loss to the occupied space, it would be increased by Night Setback because of the lower unoccupied space temperatures. But Hot Water Outside Air Reset energy savings would be reduced by Outside Air limit Shutoff because Hot Water Outside Air Reset takes credit for reduced heat loss during which Outside Air Limit Shutoff shuts down the stem supply. Therefore, the result is an offsetting interaction so the energy savings for Hot Water Outside Air Reset will not be adjusted and the combined energy savings from the three control opportunities will be the additive savings of the three individual measures.

Calculation Example

Given: 1. Hot Water Outside Air Reset energy savings = 1.0 MBtu/yr

2. Night Setback energy savings = 10.0 MBtu/yr

3. Outside Air Limit Shutoff energy savings = 3.0 MBtu/yr

Total Combined Energy Savings = 1.0 + 10.0 + 3.0 = 14.0 MBtu/yr

Cost Estimate - The items required and associated costs to accomplish Night Setback, Outside Air Limit Shutoff, and Hot Water Outside Air Reset are as follows:

Hot Water Heat (Steam/HW converter)

Item	Materials	Labor	Total
Space temperature sensor	119	17	136
Water temperature sensor	105	24	129
Thermowell	31	133	164
Outside air temperature sensor	119	17	136
Time clock (digital)	470	35	505
Motorized steam valve	414	92	506
Pneumatic valve controller	204	44	248
EP Transducer	239	44	283

Total cost = $2107/building

Steam Heat (AHU, radiator, or steam unit heater)

Item	Materials	Labor	Total
Space temperature sensor	119	17	136
Outside air temperature sensor	119	17	136
Time clock	470	35	505

(digital)			
Motorized steam valve	414	92	506
Pneumatic valve controller	204	44	248
EP transducer	239	44	283
For each AHU:			
Control relay-start/stop	25	44	69
Pneumatic damper actuator	133	30	163
Control relay-damper	25	44	69
EP valve	72	30	102

Total Cost = $1814/building+ 403/air handling unit

Summary - The following pages present individual building energy savings and cost estimates for all buildings, and the ECIP sheet for all Combined Control ECOs with an SIR greater than 1.0.

The results of the life-cycle cost analysis are listed below:

INSTALLATION	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST $	SIR
Hospital Point	2,938.196	6,552	14,511	4.58
Hadnot Point	21,887.406	48,809	162,590	3.05
Air Station	2,447.371	7,122	26,989	2.68
Rifle Range	881.979	2,567	12,113	2.15
Beach Area	627.487	1,826	8,831	2.10
French Creek	1,467.057	3,272	17,112	1.94
Camp Johnson	1,191.241	3,467	21,949	1.60
Courthouse Bay	470.566	1,369	9,363	1.48
Camp Geiger	189.864	553	4,434	1.26
Paradise Point	71.189	207	1,814	1.16

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HOSPITAL POINT	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	14,511
B. SIOH		798
C. DESIGN COST		871
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		14,562
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	14,562

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	2,938	6,552	10.18	66,701
F. TOTAL	$	2,938	6,552		66,701

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 22,011
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 6,552

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 66,701

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 4.6

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	HADNOT POINT	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	165,925
B. SIOH		9,126
C. DESIGN COST		9,956
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		166,506
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	166,506

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	21,888	48,810	10.18	496,884
F. TOTAL	$	21,888	48,810		496,884

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 163,972
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 48,810

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 496,884

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 3.0

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	NEW RIVER AIR STATION	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	26,989
B. SIOH		1,484
C. DESIGN COST		1,619
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		27,083
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	27,083

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	2,447	7,122	10.18	72,500
F. TOTAL	$	2,447	7,122		72,500

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 23,925
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 7,122

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 72,500

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	RIFLE RANGE	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	12,113
B. SIOH		666
C. DESIGN COST		727
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		12,155
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	12,155

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	882	2,567	10.18	26,128
F. TOTAL	$	882	2,567		26,128

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 8,622
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 2,567

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 26,128

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	BEACH AREA	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	8,831
B. SIOH		486
C. DESIGN COST		530
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		8,862
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	8,862

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	627	1,826	10.18	18,589
F. TOTAL	$	627	1,826		18,589

3. NON ENERGY SAVINGS (+) / COST (-)
A. ANNUAL RECURRING (+/-) $ 0
(1) DISCOUNT FACTOR (TABLE 1) 7.61
(2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 6,134
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 1,826

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 18,589

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	FRENCH CREEK	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	17,112
B. SIOH		941
C. DESIGN COST		1,027
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		17,172
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	17,172

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	1,467	3,272	10.18	33,304
F. TOTAL	$	1,467	3,272		33,304

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 10,990
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 3,272

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 33,304

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.9

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP JOHNSON	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	21,949
B. SIOH		1,207
C. DESIGN COST		1,317
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		22,026
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	22,026

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	1,191	3,467	10.18	35,289
F. TOTAL	$	1,191	3,467		35,289

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	0
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 11,645
- a. IF 3D1 IS = > 3C GO TO ITEM 4
- b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
- c. IF 3D1b IS = > 1 GO TO ITEM 4
- d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 3,467

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 35,289

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.6

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	COURTHOUSE BAY	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	MISC. BLDGS		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	9,362
B. SIOH		515
C. DESIGN COST		562
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		9,395
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	9,395

2. ENERGY SAVINGS (+) / (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	471	1,369	10.18	13,940
F. TOTAL	$	471	1,369		13,940

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) 7.61
      (2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
   B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 4,600
      a. IF 3D1 IS = > 3C GO TO ITEM 4
      b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
      c. IF 3D1b IS = > 1 GO TO ITEM 4
      d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 1,369

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 13,940

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.5

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: CAMP GEIGER
PROJECT TITLE: COMBINED CONTROLS
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	4,434
B. SIOH		244
C. DESIGN COST		266
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		4,450
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	4,450

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	190	553	10.18	5,624
F. TOTAL	$	190	553		5,624

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-) $ 0
(1) DISCOUNT FACTOR (TABLE 1) 7.61
(2) DISCOUNTED SAVING/COST (3AX3A1) $ 0

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 1,856
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 553

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 5,624

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.3

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: PARADISE POINT
PROJECT TITLE: COMBINED CONTROLS
PORTION NAME: MISC. BLDGS
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	1,814
B. SIOH		100
C. DESIGN COST		109
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		1,820
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	1,820

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	71	207	10.18	2,109
F. TOTAL	$	71	207		2,109

3. NON ENERGY SAVINGS (+) / COST (-)
A. ANNUAL RECURRING (+/-) $ 0
(1) DISCOUNT FACTOR (TABLE 1) 7.61
(2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 696
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 207

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 2,109

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 1.2

COMBINED CONTROLS ECO
HOSPITAL POINT

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
H14	0.000	2.722	4.264	6.986	16	2107	0.08
H15A	1554.782	711.213	N/A	2265.999	5053	5441	9.42
H16	0.000	6.811	1.332	8.143	18	2107	0.09
H17	137.516	43.307	N/A	180.823	403	1814	2.26
H17N	137.516	58.325	N/A	195.841	437	1814	2.44
H18	70.422	22.605	N/A	93.027	207	1814	1.16
H19	74.772	20.379	N/A	95.151	212	1814	1.19
H21	76.150	31.205	N/A	107.355	239	1814	1.34
H23	0.000	14.637	6.055	20.692	46	2107	0.22
H24	0.000	9.419	6.055	14.474	32	2107	0.15
H36	54.789	5.106	N/A	59.895	134	1814	0.75
H39	10.407	1.675	0.434	12.516	28	2107	0.14

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
HADNOT POINT

BLDG. NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
1	100.904	114.009		214.913	479	1814	2.68
2	59.015	43.080		102.095	228	1814	1.27
4	17.487	2.090		19.577	44	2217	0.20
6	0.000	54.001		54.001	120	5844	0.21
8	138.598	53.838		192.436	429	5844	0.74
11	40.053	5.670		45.723	102	4232	0.24
13	27.688	39.146		66.834	149	1814	0.83
14	60.674	1.549	2.532	64.755	144	2107	0.70
15	126.321	38.205	5.271	169.797	379	2107	1.82
16	32.995	2.062		35.057	78	1814	0.44
17	32.020	22.024		54.044	121	1814	0.67
18	0.000	13.549		13.549	30	1814	0.17
25	31.282	55.707		86.989	194	1814	1.08
27	15.781	21.095		36.876	82	1814	0.46
41	31.221	7.589	1.302	40.112	89	2107	0.43
43	12.538	11.332		23.870	53	1814	0.30
50	27.688	2.583	1.155	31.426	70	2107	0.34
54	114.447	63.738		178.185	397	2620	1.54
58	110.207	21.680		131.887	294	3023	0.99
59	99.842	47.862		147.704	329	2620	1.28
63	79.723	57.199		136.922	305	4232	0.73
65	104.909	63.243		168.152	375	5441	0.70
66	87.558	4.623	3.654	95.835	214	2107	1.03
67	0.000	16.109	4.599	20.708	46	2107	0.22
84	214.298	64.018		278.316	621	2217	2.84
102	138.598	53.092		191.690	427	5441	0.80
106	86.753	29.644		116.397	260	2217	1.19
107	218.481	29.917		248.398	554	2217	2.53
114	27.688	23.542		51.230	114	1814	0.64
115	42.248	42.870		85.118	190	2217	0.87
117	42.156	12.175		54.331	121	1814	0.68
119	21.255	16.516		37.771	84	1814	0.47
123	42.472	26.044		68.516	153	1814	0.85
127	27.688	24.157		51.845	116	1814	0.65
201	42.248	42.862		85.110	190	2217	0.87
203	15.738	19.445		35.183	78	1814	0.44
206	218.481	30.649		249.130	556	2217	2.54
214	27.688	25.867		53.555	119	1814	0.67
216	27.688	25.640		53.328	119	1814	0.67
219	27.688	24.568		52.256	117	1814	0.65
221	20.736	2.926	0.865	24.527	55	2107	0.26
223	28.104	32.392		60.496	135	1814	0.75
226	218.481	29.279		247.760	553	2217	2.53
233	15.781	14.026		29.807	66	1814	0.37
300	32.077	46.031		78.108	174	2217	0.80
302	17.924	22.788		40.712	91	1814	0.51
304	27.688	30.966		58.654	131	1814	0.73

COMBINED CONTROLS ECO
HADNOT POINT

BLDG. NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
307	218.481	28.748		247.229	551	2217	2.52
314	86.753	31.621		118.374	264	2217	1.21
315	27.688	24.623		52.311	117	1814	0.65
317	27.688	27.778		55.466	124	1814	0.69
320	25.837	37.677		63.514	142	1814	0.79
400	27.688	33.179		60.867	136	1814	0.76
401	42.248	45.024		87.272	195	2217	0.89
403	15.738	15.471		31.209	70	1814	0.39
408	0.000	48.792		48.792	109	2217	0.50
412	0.000	81.958		81.958	183	1814	1.02
416	23.077	28.285		51.362	115	1814	0.64
417	138.598	46.846		185.444	414	5844	0.72
419	27.688	19.594		47.282	105	1814	0.59
420	0.000	105.048		105.048	234	1814	1.31
422	0.000	52.773		52.773	118	5844	0.20
423	28.104	31.280		59.384	132	1814	0.74
424	218.481	30.183		248.664	555	2217	2.54
500	123.212	43.723		166.935	372	2217	1.70
501	27.688	18.768		46.456	104	1814	0.58
502	0.000	66.285		66.285	148	5844	0.26
508	76.173	30.722	3.620	110.515	246	2107	1.19
509	218.481	32.508		250.989	560	2217	2.56
516	29.515	22.928		52.443	117	1814	0.65
518	17.924	7.395		25.319	56	1814	0.32
520	20.736	14.893		35.629	79	1814	0.44
526	29.515	18.697		48.212	108	1814	0.60
751	120.495	85.477		205.972	459	3426	1.36
898	0.000	3.386	3.401	6.787	15	2107	0.07
900	128.581	12.737		141.318	315	1814	1.76
901	644.504	23.839		668.343	1490	3426	4.41
902	569.090	84.885		653.975	1458	2217	6.67
904	569.090	6.468		575.558	1283	1814	7.18
905	282.505	41.534		324.039	723	1814	4.04
907	569.090	36.267		605.357	1350	1814	7.55
908	152.766	43.932		196.698	439	3023	1.47
909	444.268	87.560		531.828	1186	1814	6.63
910	62.062	13.321		75.383	168	1814	0.94
914	282.505	25.876		308.381	688	1814	3.85
915	569.090	96.464		665.554	1484	1814	8.30
916	531.007	3.212	20.683	554.902	1237	2107	5.96
1002	5.674	0.860		6.534	15	1814	0.08
1004	55.052	2.495		57.547	128	1814	0.72
1005	113.743	4.928	4.746	123.417	275	2107	1.33
1006	27.849	19.052	1.276	48.177	107	2107	0.52
1011	626.192	14.307		640.499	1428	2217	6.54
1012	569.090	2.732		571.822	1275	1814	7.13
1015	95.946	8.710	3.737	108.393	242	2107	1.16

COMBINED CONTROLS ECO
HADNOT POINT

BLDG. NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
1041	200.083	76.957		277.040	618	5038	1.24
1100	14.192	6.207		20.399	45	1814	0.25
1101	278.818	88.932		367.750	820	6650	1.25
1103	35.132	49.936		85.068	190	2620	0.73
1104	25.348	10.297		35.645	79	1814	0.44
1105	25.348	11.198		36.546	81	1814	0.46
1106	25.348	9.017		34.365	77	1814	0.43
1107	25.348	6.925		32.273	72	1814	0.40
1108	282.505	107.372		389.877	869	1814	4.86
1111	21.055	8.810		29.865	67	1814	0.37
1114	240.887	0.816		241.703	539	1814	3.01
1115	49.475	0.753		50.228	112	1814	0.63
1116	626.192	4.436	24.390	655.018	1461	2107	7.03
1117	569.090	4.253	22.166	595.509	1328	2107	6.39
1118	569.090	50.875		619.965	1383	1814	7.73
1120	141.564	22.871		164.435	367	1814	2.05
1200	145.455	56.657		202.112	451	2620	1.75
1201	581.818	61.347		643.165	1434	1814	8.02
1202	284.132	150.505		434.637	969	4232	2.32
1207	20.194	9.723		29.917	67	1814	0.37
1208	20.194	9.519		29.713	66	1814	0.37
1209	76.317	28.142	3.497	107.956	241	2107	1.16
1211	263.989	11.929		275.918	615	1814	3.44
1212	626.192	4.721	24.390	655.303	1461	2107	7.04
1220	74.404	18.822		93.226	208	1814	1.16
1301	569.090	79.598		648.688	1447	2217	6.62
1302	80.782	3.591		84.373	188	1814	1.05
1304	52.468	13.546		66.014	147	1814	0.82
1309	68.194	17.830		86.024	192	1814	1.07
1310	68.194	16.369		84.563	189	1814	1.05
1316	569.090	4.717	22.166	595.973	1329	2107	6.40
1317	569.090	33.728	22.166	624.984	1394	2107	6.71
1400	0.000	10.396		10.396	23	1814	0.13
1401	110.798	36.785		147.583	329	2217	1.51
1403	77.308	34.276		111.584	249	1814	1.39
1404	60.610	26.514		87.124	194	1814	1.09
1407	25.348	25.752		51.100	114	1814	0.64
1409	68.194	15.705		83.899	187	1814	1.05
1410	68.194	13.815		82.009	183	1814	1.02
1450	199.540	8.967	7.772	216.279	482	2107	2.32
1500	137.324	60.480		197.804	441	1814	2.47
1502	693.913	66.795		760.708	1696	1814	9.49
1601	335.403	64.641		400.044	892	1814	4.99
1606	209.555	36.230		245.785	548	5441	1.02
1607	71.093	9.704		80.797	180	1814	1.01
1610	67.579	10.730		78.309	175	1814	0.98
1611	81.667	12.766		94.433	211	2217	0.96

COMBINED CONTROLS ECO
HADNOT POINT

BLDG. NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
1612	79.422	10.113		89.535	200	1814	1.12
1613	22.658	0.554		23.212	52	1814	0.29
1706	49.944	2.169		52.113	116	1814	0.65
1707	92.964	15.207		108.171	241	1814	1.35
1750	102.029	10.485		112.514	251	2217	1.15
1755	74.002	8.747		82.749	185	2217	0.84
1771	174.667	3.687	6.803	185.157	413	2107	1.99
1775	548.916	3.387	21.380	573.683	1279	2107	6.16
1780	205.054	2.183	7.987	215.224	480	2107	2.31
HP255	0.000	2.533	5.026	7.559	17	2107	0.08
HP265	0.000	2.618	5.026	7.644	17	2107	0.08
HP275	0.000	2.497	5.026	7.523	17	2107	0.08
HP285	0.000	2.784	5.026	7.810	17	2107	0.08
HP295	0.000	2.533	5.026	7.559	17	2107	0.08
HP405	0.000	3.807	5.026	8.833	20	2107	0.09
HP1016	54.814	14.054		68.868	154	1814	0.86

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
NEW RIVER AIR STATION

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
AS114	32.336	13.437	N/A	45.773	133	1814	0.74
AS118	102.814	15.492	N/A	118.306	344	2217	1.57
AS122	64.569	27.276	N/A	91.845	267	2217	1.22
AS124	71.207	31.923	N/A	103.130	300	2217	1.37
AS130	64.614	51.217	N/A	115.831	337	1814	1.89
AS202	69.405	66.119	N/A	135.524	394	2217	1.80
AS205	36.786	23.428	N/A	60.214	175	3023	0.59
AS208	38.425	2.210	N/A	40.635	118	3829	0.31
AS215	217.607	62.139	N/A	279.746	814	1814	4.56
AS216	217.607	59.747	N/A	277.354	807	1814	4.51
AS217	217.607	60.382	N/A	277.989	809	2620	3.13
AS232	50.219	18.478	N/A	68.697	200	2620	0.77
AS236	38.129	24.731	N/A	62.860	183	1814	1.02
AS302	45.259	29.180	N/A	74.439	217	2217	0.99
AS312	51.754	1.878	2.159	55.791	162	2107	0.78
AS320	57.198	1.209	2.387	60.794	177	2107	0.85
AS414	33.532	21.094	N/A	54.626	159	1814	0.89
AS424	305.526	97.664	N/A	403.190	1173	2217	5.37
AS425	22.199	4.997	N/A	27.196	79	1814	0.44
AS502	0.000	37.765	N/A	37.765	110	1814	0.62
AS4012	53.702	13.361	2.552	69.615	203	2107	0.98
AS4030	0.000	6.497	3.900	10.397	30	2107	0.14
AS4035	0.000	2.331	3.602	5.933	17	2107	0.08
AS4110	243.531	8.313	N/A	251.844	733	1814	4.10
AS4120	40.332	4.324	N/A	44.656	130	3023	0.44
AS4122	25.309	4.120	N/A	29.429	85	2217	0.39
AS4141	51.816	4.189	N/A	56.005	163	2217	0.75
AS4145	18.897	2.714	N/A	21.611	63	2217	0.29
AS4146	81.790	3.682	3.185	88.657	258	2107	1.24
AS4157	37.153	5.954	1.550	44.657	130	2107	0.62
AS4158	219.512	13.033	8.550	241.095	702	2107	3.38

NS - Night Setback
OALS - Outside Air Limit Shutoff
HW - Hot Water Outside Air Reset

COMBINED CONTROLS ECO
RIFLE RANGE

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
RR1	0.000	105.654	N/A	105.654	307	1173	3.01
RR2	0.000	103.797	N/A	103.797	302	1173	2.95
RR3	83.214	25.711	N/A	108.925	317	2620	1.23
RR4	0.000	97.647	N/A	97.647	284	1173	2.78
RR5	0.000	105.878	N/A	105.878	308	1173	3.01
RR8	41.550	34.635	N/A	76.185	222	1814	1.24
RR9	0.000	49.622	N/A	49.622	144	1173	1.41
RR10	15.738	14.689	N/A	30.427	89	2217	0.41
RR11	162.783	71.488	N/A	234.271	682	1814	3.81
RR12	39.562	23.784	N/A	63.346	184	1814	0.35

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
BEACH AREA

BLDG. NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
BA101	35.760	5.636		41.396	120	2620	0.47
BA102	156.161	40.901		197.062	573	1814	3.21
BA103	49.639	22.113		71.752	209	2620	0.81
BA104	0	249.557		249.557	726	3591	2.05
BA105	156.161	24.707		180.868	526	3426	1.56
BA128	47.214	0.095		47.309	138	1814	0.77

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
FRENCH CREEK

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
FC100	673.547	77.924	N/A	751.471	1676	4635	3.67
FC190	59.479	17.728	N/A	77.207	172	4232	0.41
FC200	169.137	38.664	N/A	207.801	463	3023	1.56
FC241	103.841	1.847	4.044	109.732	245	2107	1.18
FC251	121.267	39.265	N/A	160.532	358	3426	1.06
FC301	27.494	23.726	N/A	51.220	114	1814	0.64
FC302	42.300	38.360	N/A	80.660	180	1814	1.01
FC303	80.603	72.327	3.831	156.861	350	2107	1.68
FC312	41.659	16.422	N/A	58.081	130	2217	0.59
FC313	24.226	3.313	1.011	28.550	64	2107	0.36
FC364	38.449	4.825	1.604	44.878	100	2107	0.48
FC573	0.000	4.157	4.652	8.809	20	2107	0.10

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
CAMP JOHNSON

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
M90	37.156	16.314	N/A	53.470	156	2217	0.71
M100	17.422	17.708	N/A	35.130	102	1814	0.57
M101	79.701	41.194	N/A	120.895	352	2620	1.36
M102	18.754	24.583	N/A	43.337	126	1814	0.71
M103	15.218	3.163	N/A	18.381	54	1814	0.30
M104	57.799	43.398	N/A	101.197	295	3023	0.99
M105	19.475	18.461	N/A	37.936	110	1814	0.62
M112	50.503	18.055	N/A	68.558	200	2217	0.92
M116	38.234	1.079	1.595	40.908	119	2107	0.57
M123	27.885	7.676	N/A	35.561	104	1814	0.58
M124	27.885	8.553	N/A	36.438	106	1814	0.59
M125	27.885	5.245	N/A	33.130	96	1814	0.54
M126	27.885	6.651	N/A	34.536	101	1814	0.57
M127	27.885	7.374	N/A	35.259	103	1814	0.58
M128	87.495	15.002	3.651	106.148	309	2107	1.49
M129	87.755	44.570	N/A	132.325	385	2217	1.76
M130	50.438	5.932	2.104	58.474	170	2107	0.82
M131	57.098	2.407	2.382	61.887	180	2107	0.87
M132	67.512	26.851	N/A	94.363	275	1814	1.54
M134	97.392	6.951	N/A	104.343	304	2217	1.39
M178	11.023	9.469	N/A	20.492	60	1814	0.34
M201	23.737	10.023	N/A	33.760	98	1814	0.55
M202	79.701	31.813	N/A	111.514	325	1814	1.82
M205	0.000	8.934	N/A	8.934	26	1814	0.15
M206	0.000	8.454	N/A	8.454	25	1814	0.14
M207	0.000	6.690	N/A	6.690	19	1814	0.11
M208	0.000	7.666	N/A	7.666	22	1814	0.12
M209	0.000	9.013	N/A	9.013	26	1814	0.15
M210	0.000	6.500	N/A	6.500	19	1814	0.11
M215	27.885	18.621	N/A	46.506	135	1814	0.76
M216	27.885	9.339	N/A	37.224	108	1814	0.60
M231	0.000	11.419	N/A	11.419	33	2620	0.13
M237	8.766	7.866	0.365	16.997	49	2106	0.24
M240	61.156	11.835	N/A	72.991	212	2620	0.82
M301	30.478	6.778	N/A	37.256	108	1814	0.61
M302	13.091	6.531	N/A	19.625	57	1814	0.32
M303	45.389	28.955	N/A	77.344	225	2217	1.03
M305	0.000	2.754	N/A	2.754	8	2217	0.04
M307	35.705	1.359	N/A	37.064	108	2217	0.49
M308	13.091	3.731	N/A	16.822	49	1814	0.27
M309	0.000	23.060	N/A	23.060	67	2217	0.31
M311	0.000	21.756	N/A	21.756	63	2217	0.29
M313	0.000	0.934	N/A	0.934	3	2217	0.01
M314	30.478	6.370	N/A	36.848	107	1814	0.60
M315	13.091	6.543	N/A	19.634	57	1814	0.32
M316	0.000	1.551	N/A	1.551	4	2217	0.02
M318	0.000	1.027	N/A	1.027	3	2217	0.01

COMBINED CONTROLS ECO
CAMP JOHNSON

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
M319	30.478	9.099	N/A	39.577	115	1814	0.64
M321	45.389	2.202	N/A	47.591	138	2217	0.63
M323	27.885	5.957	N/A	33.842	98	2620	0.38
M324	115.743	94.413	N/A	210.156	612	3023	2.05
M326	39.538	34.484	N/A	74.022	215	1814	1.20
M327	39.538	25.740	N/A	65.278	190	2620	0.74
M401	13.091	6.184	N/A	19.275	56	1814	0.31
M402	13.091	5.939	N/A	19.030	55	1814	0.31
M403	45.389	2.248	N/A	47.637	139	2217	0.64
M405	27.885	5.451	N/A	33.336	97	1814	0.54
M406	27.885	0.664	1.163	29.712	86	2106	0.41
M407	26.616	5.841	N/A	32.457	94	2217	0.43
M408	12.984	7.502	N/A	20.486	60	1814	0.34
M409	45.389	2.929	N/A	48.318	141	2217	0.65
M411	27.885	0.815	1.163	29.863	87	2106	0.42
M412	27.885	0.734	1.163	29.782	87	2106	0.42
M413	26.616	1.938	1.110	29.664	86	2106	0.42
M414	13.091	6.183	N/A	19.274	56	1814	0.31
M415	30.478	5.709	N/A	36.187	105	1814	0.56
M416	0.000	2.941	N/A	2.941	9	2217	0.04
M418	26.616	6.474	N/A	33.090	96	2217	0.44
M419	13.091	5.595	N/A	18.686	54	1814	0.30
M420	45.389	2.944	N/A	48.333	141	2217	0.65
M422	45.389	2.906	N/A	48.295	141	2217	0.65
M424	115.743	39.558	4.830	160.131	466	2106	2.24
M441	0.000	12.640	18.247	30.887	90	2106	0.43
M501	30.478	4.624	N/A	35.102	102	1814	0.57
M502	13.091	7.615	N/A	20.706	60	1814	0.34
M503	0.000	3.323	N/A	3.323	10	2217	0.05
M504	0.000	2.654	N/A	2.654	8	2217	0.04
M506	30.478	5.773	N/A	36.251	105	1814	0.59
M507	0.000	2.754	N/A	2.754	8	2217	0.04
M509	0.000	2.466	N/A	2.466	7	2217	0.03
M511	0.000	1.422	1.490	1.422	4	2106	0.02
M512	30.478	6.052	N/A	36.530	106	1814	0.59
M513	13.091	7.935	N/A	21.026	61	1814	0.34
M514	0.000	2.439	N/A	2.439	7	2217	0.03
M516	0.000	2.214	N/A	2.214	6	6247	0.01
M518	0.000	2.669	N/A	2.669	8	2217	0.04
M520	13.091	5.303	N/A	18.394	54	1814	0.30
M521	0.000	3.871	N/A	3.871	11	2217	0.05
M522	0.000	3.061	N/A	3.061	9	2217	0.04
M601	13.091	7.531	N/A	20.622	60	1814	0.34
M602	13.091	4.541	N/A	17.632	51	1814	0.29
M603	13.091	6.102	N/A	19.193	56	1814	0.31
M604	0.000	2.317	N/A	2.317	7	2217	0.03
M606	30.478	8.238	N/A	38.716	113	1814	0.63

COMBINED CONTROLS ECO
CAMP JOHNSON

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
M607	0.000	2.308	N/A	2.308	7	2217	0.03
M609	0.000	2.803	N/A	2.803	8	2217	0.04
M611	51.379	3.679	N/A	55.058	160	2217	0.73
M612	13.091	6.661	N/A	19.752	57	1814	0.32
M613	13.091	7.341	N/A	20.432	59	1814	0.33
M614	0.000	2.700	N/A	2.700	8	2217	0.04
M616	0.000	2.207	N/A	2.207	6	2217	0.03
M619	13.091	6.598	N/A	19.689	57	1814	0.32
M620	13.089	6.482	N/A	19.571	57	1814	0.32
M621	0.000	3.345	N/A	3.345	10	2217	0.05
M622	0.000	2.785	N/A	2.785	8	2217	0.04

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
COURTHOUSE BAY

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
BB2	26.343	1.832	1.408	29.583	86	2107	0.41
BB5	22.233	27.500	N/A	49.733	145	1814	0.81
BB8	0.000	9.357	N/A	9.357	27	1173	0.26
BB10	20.355	17.235	N/A	37.590	109	1814	0.61
BB11	0.000	60.928	N/A	60.928	177	6815	0.29
BB12	0.000	61.347	N/A	61.347	178	7218	0.28
BB13	0.000	60.543	N/A	60.543	176	7218	0.28
BB14	0.000	60.674	N/A	60.674	176	6815	0.29
BB15	13.885	11.935	N/A	25.820	75	1814	0.42
BB16	13.885	8.502	N/A	22.387	65	1814	0.36
BB27	23.610	12.861	N/A	36.471	106	1814	0.59
BB28	50.015	22.150	N/A	72.165	210	1814	1.17
BB45	0	2.316	2.898	5.214	15	2107	0.07
BB50	72.628	3.790	3.030	79.448	231	2107	1.11
BB51	138.662	33.077	N/A	171.739	500	1814	2.80
BB52	59.150	22.920	N/A	82.070	239	1814	1.34
BB54	47.292	17.852	N/A	65.144	190	1814	1.06
BB72	0	3.990	N/A	3.990	12	1814	0.07
BB269	0	4.235	5.026	9.261	27	2107	0.13

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
CAMP GEIGER

BLDG.* NO.	BUILDING ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
G770	56.922	2.969	2.586	62.477	182	2107	0.88
TC735	23.602	4.942		28.544	83	1814	0.46
TC832	23.602	4.942		28.544	83	1814	0.46
TC834	23.602	4.942		28.544	83	1814	0.46
TC846	87.037	8.371		95.408	278	1814	1.55
TC900	55.376	0.000		55.376	161	1814	0.90
TC910	37.425	57.031		94.456	275	2620	1.06

*Remaining buildings not listed due to low energy potential.

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

COMBINED CONTROLS ECO
PARADISE POINT

BUILDING NO.	ENERGY SAVINGS (MBTU/YR) NS	OALS	HW	TOTAL MBTU/YR	ENERGY SAVING $/YR	CAPITOL COST $	SIR
2600	0.000	12.558	N/A	12.558	36	1173	0.35
2603	0.000	20.285	N/A	20.285	59	4800	0.14
2624	45.590	25.599	N/A	71.189	207	1814	1.16
2625	15.704	11.778	N/A	27.372	80	1814	0.45
2626	20.364	8.239	N/A	28.603	83	1814	0.47
2627	20.364	12.417	N/A	32.781	95	1814	0.53
2628	22.406	10.681	N/A	33.087	96	1814	0.54
2629	33.144	6.821	N/A	39.965	116	1814	0.65

NS = Night Setback
OALS = Outside Air Limit Shutoff
HW = Hot Water Outside Air Reset

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5.0 ECO ANALYSIS RESULTS

5.1 ECO RANKING

The individual ECOs with Savings-to-Investment Ratios (SIRs) greater than 1.0 have been ranked from largest to smallest in Table 5.1-1, ECO Rankings. Information about the quantity and dollar value of the individual ECO savings is included which is used to compute the individual ECOs SIR.

TABLE 5.1-1
ECO RANKINGS

ECO	BLDG. NO.	ENERGY SAVINGS MBTU/YR.	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
SYPHON JET SUMP PUMP	--	0.000	193,600	187,200	7.80
TOTAL		0.000	193,600	187,200	7.80
PIPE INSULATION					
BEACH AREA	(SEE TABLE 5.1-2)	3,938.427	11,461	18,944	8.15
HOSPITAL POINT	(SEE TABLE 5.1-3)	47,366.701	105,628	176,033	8.07
COURTHOUSE BAY	(SEE TABLE 5.1-4)	7,817.901	22,750	42,770	7.15
CAMP GEIGER	(SEE TABLE 5.1-5)	27,855.980	81,061	153,254	7.11
RIFLE RANGE	(SEE TABLE 5.1-6)	12,104.915	35,225	67,224	7.05
CAMP JOHNSON	(SEE TABLE 5.1-7)	16,839.867	49,004	103,385	6.37
AIR STATION	(SEE TABLE 5.1-8)	15,178.842	44,170	101,880	5.83
HADNOT POINT	(SEE TABLE 5.1-9)	113,487.252	253,077	598,027	5.69
PARADISE POINT	(SEE TABLE 5.1-10)	3,910.616	11,380	27,100	5.65
FRENCH CREEK	(SEE TABLE 5.1-11)	2,818.575	6,285	18,735	4.50
TOTAL		251,319.076	620,041	1,307,352	6.38
COMBINED CONTROLS					
HOSPITAL POINT	(SEE TABLE 5.1-12)	2,938.196	6,552	14,511	4.58
HADNOT POINT	(SEE TABLE 5.1-12)	21,887.406	48,810	165,925	2.98
AIR STATION	(SEE TABLE 5.1-12)	2,447.371	7,122	26,989	2.68
BEACH AREA	(SEE TABLE 5.1-12)	627.487	1,826	8,831	2.10
RIFLE RANGE	(SEE TABLE 5.1-12)	881.979	2,567	12,113	2.15
FRENCH CREEK	(SEE TABLE 5.1-12)	1,467.057	3,272	17,405	1.91
CAMP JOHNSON	(SEE TABLE 5.1-12)	1,191.241	3,467	21,949	1.60
COURTHOUSE BAY	(SEE TABLE 5.1-12)	470.566	1,369	9,363	1.48
CAMP GEIGER	(SEE TABLE 5.1-12)	189.864	553	4,434	1.26
PARADISE POINT	(SEE TABLE 5.1-12)	71.189	207	1,814	1.16
TOTAL		32,172.356	75,745	283,334	2.72

TABLE 5.1-2
ECO RANKING - BEACH AREA
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
BA104	1,500.462	4366	5337	13.17
BA101	41.655	121	166	12.18
BA105	1,353.908	3939	5822	11.34
BA128	2.591	7	13	9.58
BA102	742.874	2161	4802	7.55
BA103	296.937	864	2804	5.16
TOTAL	3938.427	11461	18944	8.147

TABLE 5.1-3
ECO RANKING - HOSPITAL POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
H14	202.441	451	658	9.22
H15A	44,538.773	99321	160548	8.32
H16	288.530	643	1181	7.32
H18	367.577	819	1592	6.92
H24	135.844	302	593	6.86
H19	405.750	904	1917	6.34
H23	191.244	426	959	5.97
H39	75.700	168	383	5.92
H21	11.752	26	64	5.49
H36	74.573	166	421	5.30
H17N	800.186	1784	5055	4.74
H17	274.331	611	2662	3.09
TOTAL	47366.701	105628	176033	8.07

TABLE 5.1-4
ECO RANKING - COURTHOUSE BAY
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
BB50	371.310	1080	961	18.84
BB250	61.921	180	235	12.80
BB255	61.921	180	235	12.80
BB15	159.479	464	711	10.94
BB10	854.182	2485	3834	10.87
BB52	465.528	1354	2108	10.77
BB2	13.835	40	63	10.66
BB51	465.804	1355	2155	10.54
BB269	3.866	11	17	10.50
BB28	430.901	1253	2040	10.30
BB265	25.003	72	119	10.18
BB8	120.162	349	580	10.10
BB5	704.642	2050	3432	10.01
BB54	269.918	785	1331	9.89
BB16	192.531	560	1078	8.71
BB12	712.779	2074	4018	8.65
BB13	685.497	1994	3938	8.49
BB11	584.917	1702	3784	7.54
BB260	59.038	171	399	7.21
BB270	59.038	171	399	7.21
BB14	531.509	1546	3939	6.58
BB7	741.473	2157	5807	6.23
BB45	13.263	38	183	3.52
BB72	10.813	31	372	1.41
BB27	218.571	636	1032	10.33
TOTAL	7817.901	22750	42770	7.15

TABLE 5.1-5
ECO RANKING - CAMP GEIGER
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
TC740	135.827	395	343	19.28
TC1066	311.659	906	799	19.03
TC845	40.066	116	103	18.93
TC814	30.561	88	79	18.72
TC815	34.479	100	90	18.64
TC1140	43.083	125	113	18.55
TC844	29.316	85	77	18.52
TC841	47.465	138	125	18.39
TC810	37.194	108	101	17.92
TC744	63.126	183	189	16.28
TC1040	35.414	103	108	15.90
TC840	31.853	92	108	14.31
TC715	25.874	75	89	14.08
TC714	25.874	75	89	14.08
TC710	25.874	75	89	14.08
TC711	23.655	68	84	13.67
TC1141	29.487	85	105	13.66
TC1042	29.700	86	109	13.25
TC851	25.066	72	95	12.87
TC1013	23.665	68	90	12.79
TC1050	18.546	53	71	12.71
TC850	22.314	64	87	12.51
TC1063	153.115	445	614	12.17
TC743	24.021	69	96	12.14
TC741	20.509	59	82	12.12
TC834	403.548	1174	1654	11.90
TC842	32.929	95	135	11.87
TC1010	32.166	93	133	11.79
TC1041	25.361	73	105	11.75
TC832	534.713	1556	2266	11.51
TC1054	38.331	111	165	11.33
TC1053	29.628	86	130	11.11
TC735	260.266	757	1155	10.99
TC1059	110.045	320	488	10.98
TC855	488.000	1420	2197	10.83
TC1065	225.467	656	1018	10.80
TC1067	215.449	626	975	10.78
TC745	89.018	259	404	10.73
TC1143	207.268	603	960	10.53
TC1051	24.312	70	113	10.50
TC1068	209.233	608	972	10.49
TC1162	199.182	579	927	10.47
TC950	17.051	49	79	10.44
TC1016	24.398	71	114	10.38
TC1015	24.398	71	114	10.38
TC1012	24.398	71	114	10.38

TABLE 5.1-5
ECO RANKING - CAMP GEIGER
PIPE INSULATION

	ENERGY SAVINGS			
BLDG.	MBTU/YR	$/YR	CAPITAL COST	SIR
TC1004	465.490	1354	2203	10.31
TC854	474.757	1381	2283	10.14
TC716	42.092	122	202	10.13
TC829	24.403	71	117	10.11
TC828	115.398	335	560	10.04
TC1038	112.242	326	545	10.04
TC727	18.171	52	88	10.04
TC726	18.171	52	88	10.04
TC846	424.930	1236	2071	10.01
TC1039	99.315	289	484	9.99
TC1029	138.909	404	680	9.96
TC1131	130.706	380	640	9.95
TC1060	144.658	420	710	9.93
TC808	313.538	912	1548	9.87
TC809	192.828	561	954	9.86
TC1132	133.807	389	661	9.86
TC1028	133.464	388	660	9.86
TC1119	133.464	388	660	9.86
TC1047	144.801	421	717	9.85
TC1019	139.921	407	693	9.84
TC1017	141.709	412	702	9.83
TC1018	140.957	410	699	9.83
TC709	189.912	552	942	9.82
TC704	189.912	552	942	9.82
TC754	189.912	552	942	9.82
TC705	189.912	552	942	9.82
TC706	189.912	552	942	9.82
TC707	408.195	1187	2040	9.76
TC708	401.710	1168	2012	9.74
TC749	360.350	1048	1804	9.74
TC729	132.334	385	664	9.72
TC1061	429.489	1249	2171	9.65
TC1062	142.446	414	721	9.63
TC1044	30.980	90	158	9.55
TC728	2.545	7	13	9.54
TC1160	189.494	551	974	9.49
TC816	20.566	59	105	9.49
TC736	275.769	802	1426	9.43
TC1007	382.568	1113	1986	9.40
TC718	321.062	934	1667	9.39
TC719	319.507	929	1660	9.39
TC826	317.434	923	1649	9.39
TC817	317.434	923	1649	9.39
TC819	317.434	923	1649	9.39
TC818	317.434	923	1649	9.39
TC1049	155.699	453	808	9.39

TABLE 5.1-5
ECO RANKING - CAMP GEIGER
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
TC827	322.656	938	1677	9.38
TC1046	404.605	1177	2105	9.37
TC1005	381.286	1109	1984	9.37
TC839	377.324	1098	1963	9.37
TC836	324.699	944	1690	9.37
TC838	324.181	943	1688	9.37
TC1026	333.447	970	1738	9.36
TC837	321.847	936	1677	9.36
TC1006	400.535	1165	2092	9.34
TC738	328.188	955	1714	9.34
TC739	13.979	40	73	9.33
TC848	412.191	1199	2157	9.32
TC853	412.191	1199	2157	9.32
TC1036	172.456	501	904	9.30
TC1037	171.938	500	902	9.30
TC1058	462.200	1345	2429	9.28
TC1057	462.200	1345	2429	9.28
TC1048	456.518	1328	2399	9.28
TC1027	452.478	1316	2386	9.25
TC1003	432.045	1257	2286	9.22
TC1055	140.106	407	741	9.22
TC807	298.512	868	1581	9.21
TC804	298.512	868	1581	9.21
TC805	308.548	897	1638	9.19
TC1009	403.467	1174	2143	9.18
TC1069	175.973	512	938	9.14
TC806	276.242	803	1475	9.13
TC951	132.131	384	710	9.07
G530	69.473	202	374	9.04
TC712	15.975	46	87	8.91
TC737	72.682	211	398	8.90
TC910	2,015.422	5864	11269	8.72
TC900	238.960	695	1353	8.61
TC1052	22.361	65	127	8.58
TC1056	144.019	419	836	8.40
G550	51.176	148	300	8.30
TC701	63.572	184	381	8.12
TC742	14.381	41	88	7.91
G520	45.672	132	310	7.17
G770	173.891	506	1197	7.08
TC1110	130.012	378	1043	6.07
TC812	32.849	95	272	5.89
TC1008	165.646	482	1714	4.71
TC717	154.644	450	1636	4.61
TC1142	169.125	492	1826	4.52
G640	886.614	2580	9703	4.45

TABLE 5.1-5
ECO RANKING - CAMP GEIGER
PIPE INSULATION

	ENERGY SAVINGS			
BLDG.	MBTU/YR	$/YR	CAPITAL COST	SIR
G540	19.419	56	244	3.87
TC1064	43.726	127	633	3.36
TC748	69.968	203	1253	2.72
TC1161	34.761	101	647	2.62
TC753	27.476	79	573	2.33
TC750	58.569	170	1241	2.30
TC751	83.721	243	1798	2.27
TC752	43.114	125	924	2.27
TC1045	29.652	86	137	10.51
TOTAL	27,855.980	81061	153254	7.11

TABLE 5.1-6
ECO RANKING - RIFLE RANGE
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
RR11	1,512.647	4401	7520	9.81
RR12	428.893	1248	2141	9.77
RR1	2,251.451	6551	11780	9.32
RR5	2,202.735	6409	11713	9.17
RR4	1,870.883	5444	10000	9.13
RR2	2,097.979	6105	11307	9.05
RR9	592.621	1724	3222	8.97
RR8	752.859	2190	5123	7.17
RR10	242.295	705	2670	4.42
RR3	152.552	443	1748	4.25
TOTAL	12104.915	35225	67224	7.05

TABLE 5.1-7
ECO RANKING - CAMP JOHNSON
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
M130	633.202	1842	1533	20.15
M611	193.568	563	540	17.48
M131	65.149	189	183	17.33
M316	51.104	148	152	16.32
M621	74.612	217	233	15.58
M403	37.435	108	129	14.11
M504	105.444	306	373	13.97
M507	89.221	259	311	13.96
M305	97.226	282	342	13.84
M514	56.599	164	204	13.51
M327	26.888	78	101	12.91
M614	164.819	479	650	12.35
M303	486.310	1415	2023	11.72
M311	385.439	1121	1609	11.68
M420	63.849	185	266	11.67
M309	383.481	1115	1610	11.62
M139	880.246	2561	3734	11.50
M409	52.358	152	224	11.40
M321	79.832	232	342	11.37
M609	97.855	284	420	11.36
M128	300.803	875	1305	11.24
M604	72.578	211	315	11.21
M516	130.952	381	571	11.18
M307	46.227	134	213	10.56
M513	13.975	40	65	10.41
M616	73.710	214	346	10.38
M422	48.908	142	236	10.10
M602	165.899	482	811	9.97
M215	775.760	2257	3806	9.94
M522	96.818	281	476	9.91
M416	53.061	154	261	9.88
M509	90.235	262	446	9.86
M622	148.726	432	739	9.81
M129	697.968	2031	3469	9.81
M178	39.616	115	197	9.76
M103	3.841	11	19	9.76
M123	340.603	991	1710	9.71
M237	29.813	86	149	9.70
M603	143.842	418	727	9.65
M124	391.670	1139	1981	9.64
M105	319.314	929	1615	9.64
M90	19.204	55	97	9.63
M216	382.547	1113	1940	9.62
M323	6.219	18	31	9.58
M127	343.272	998	1747	9.58
M502	5.183	15	26	9.58
M319	4.146	12	21	9.58

TABLE 5.1-7
ECO RANKING - CAMP JOHNSON
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
M126	306.027	890	1574	9.48
M201	12.473	36	64	9.48
M413	22.710	66	117	9.41
M101	1114.034	3241	5778	9.40
M301	92.804	270	485	9.33
M501	212.028	617	1108	9.33
M125	282.550	822	1478	9.32
M512	269.530	784	1413	9.30
M606	6.010	17	31	9.25
M620	12.660	36	66	9.23
M612	28.462	82	150	9.22
M240	105.567	307	560	9.18
M506	20.296	59	107	9.18
M520	7.759	22	41	9.14
M302	30.123	87	161	9.11
M613	13.909	40	74	9.08
M601	6.838	19	37	9.01
M518	69.303	201	378	8.93
M412	1.476	4	8	8.91
M315	73.022	212	402	8.85
M104	1621.867	4719	9100	8.69
M401	29.904	87	170	8.57
M414	12.321	35	71	8.41
M402	20.898	60	123	8.25
M313	19.533	56	116	8.21
M112	34.290	99	205	8.15
M308	7.037	20	42	8.10
M406	7.835	22	47	8.08
M411	2.688	7	16	8.07
M441	53.727	156	330	7.93
M619	15.312	44	95	7.83
M408	15.621	45	98	7.77
M419	8.792	25	55	7.71
M318	28.108	81	179	7.63
M314	9.101	26	58	7.61
M102	700.944	2039	4659	7.34
M415	90.540	263	611	7.22
M511	30.174	87	222	6.61
M134	180.220	524	1331	6.60
M207	45.743	133	367	6.07
M206	82.677	240	708	5.69
M231	31.138	90	286	5.29
M607	63.621	185	591	5.24
M100	303.369	882	2856	5.18
M132	515.267	1499	4902	5.12
M503	16.578	48	162	4.97
M407	69.540	202	734	4.62

TABLE 5.1-7
ECO RANKING - CAMP JOHNSON
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
M209	65.497	190	710	4.50
M405	5.961	17	70	4.11
M202	266.017	774	3437	3.77
M418	47.201	137	658	3.49
M424	269.877	785	3795	3.47
M205	8.665	25	148	2.85
M521	20.922	60	379	2.68
M324	641.844	1867	12625	2.48
M208	22.600	65	479	2.29
M116	3.042	8	106	1.39
M210	14.288	41	514	1.35
M326	0.000	0	0	0.00
TOTAL	16839.867	49004	103385	6.37

TABLE 5.1-8
ECO RANKING - NEW RIVER AIR STATION
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
AS4146	148.171	431	431	16.77
AS211	218.794	636	663	16.08
AS312	98.782	287	381	12.62
AS240	127.891	372	524	11.89
AS4025	287.025	835	1228	11.40
AS4020	287.025	835	1228	11.40
AS222	98.793	287	427	11.27
AS118	285.900	831	1244	11.21
AS205	112.456	327	508	10.79
AS232	53.356	155	245	10.61
AS4110	104.339	303	503	10.11
AS320	11.752	34	56	10.11
AS4122	197.199	573	960	10.01
AS114	19.542	56	96	9.92
AS217	2,068.351	6018	10207	9.88
AS216	2001.706	5824	9956	9.81
AS414	44.363	129	223	9.68
AS215	1,969.767	5732	9964	9.64
AS130	469.157	1365	2398	9.54
AS4120	94.063	273	492	9.32
AS225	74.511	216	390	9.30
AS4100	317.044	922	1681	9.20
AS4015	90.576	263	488	9.04
AS502	443.815	1291	2530	8.55
AS302	486.780	1416	2972	7.99
AS236	345.818	1006	2205	7.65
AS4012	300.530	874	1938	7.56
AS425	13.895	40	96	7.03
AS226	930.963	2709	6463	7.02
AS214	129.755	377	943	6.71
AS122	227.705	662	1656	6.70
AS504	1,419.548	4130	10561	6.55
AS212	115.731	336	890	6.34
AS4035	47.231	137	393	5.85
AS208	32.125	93	291	5.37
AS213	72.493	210	715	4.94
AS202	212.540	618	2657	3.90
AS515	112.466	327	1432	3.83
AS424	332.941	968	4264	3.81
AS4030	44.144	128	740	2.90
AS4010	76.047	221	1288	2.88
AS4106	141.613	412	2404	2.87
AS4158	94.642	275	1636	2.82
AS518	92.658	269	2237	2.02
AS124	91.915	267	2603	1.72

TABLE 5.1-8
ECO RANKING - NEW RIVER AIR STATION
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
AS4108	232.924	677	6673	1.70
AS4141	0.000	0	0	0.00
AS4157	0.000	0	0	0.00
AS4145	0.000	0	0	0.00
TOTAL	15178.842	44170	101880	5.83

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
1220	258.425	576	669	11.57
211	724.469	1615	1943	11.18
3	160.070	356	430	11.15
9	434.899	969	1196	10.90
307	247.899	552	685	10.85
916	33.684	75	99	10.19
1042	113.418	252	349	9.73
1012	40.840	91	129	9.44
221	89.587	199	285	9.42
325	660.865	1473	2135	9.28
322	878.228	1958	2867	9.18
1101	3,687.815	8223	12179	9.08
907	103.048	229	340	9.07
25	2,490.396	5553	8272	9.03
1116	43.002	95	143	9.01
1140	83.779	186	280	8.95
521	564.315	1258	1931	8.76
1011	87.464	195	311	8.41
411	605.925	1351	2171	8.37
122	469.333	1046	1680	8.37
1317	35.663	79	129	8.28
10	902.147	2011	3367	8.03
1015	93.695	208	353	7.95
67	129.023	287	498	7.76
4	92.787	206	376	7.39
50	53.436	119	220	7.27
12	817.991	1824	3375	7.26
304	509.959	1137	2123	7.20
524	342.574	763	1427	7.19
HP405	17.369	38	72	7.18
914	290.826	648	1216	7.16
1201	3,579.066	7981	15268	7.03
908	97.818	218	417	7.02
HP51	118.979	265	511	6.97
236	738.537	1646	3181	6.96
1006	350.520	781	1515	6.93
1103	825.247	1840	3593	6.88
8	795.051	1772	3477	6.85
1310	796.106	1775	3487	6.84
117	126.795	282	559	6.80
1400	185.750	414	833	6.68
6	730.948	1630	3297	6.65
317	339.857	757	1534	6.64
400	392.047	874	1778	6.61
HP215	43.504	97	197	6.61
S86	74.620	166	339	6.59
1707	274.117	611	1246	6.59

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
540	771.102	1719	3525	6.56
909	3,830.819	8542	17677	6.50
1450	17.371	38	80	6.49
314	176.782	394	819	6.47
HP165	11.756	26	54	6.44
219	396.986	885	1849	6.43
13	600.717	1339	2801	6.43
420	1,822.846	4064	8546	6.39
915	215.279	480	1012	6.38
HP127	23.892	53	112	6.37
203	226.590	505	1070	6.35
419	305.667	681	1445	6.34
123	1,766.732	3939	8375	6.32
1209	263.060	586	1247	6.32
205	965.480	2153	4594	6.30
65	1,383.130	3084	6580	6.30
17	960.999	2143	4569	6.30
1407	1,413.693	3152	6731	6.29
106	144.923	323	690	6.29
902	1,241.396	2768	5922	6.28
41	103.865	231	498	6.25
226	138.939	309	665	6.25
508	109.741	244	527	6.24
1106	472.972	1054	2280	6.22
S96	13.983	31	67	6.22
1212	60.944	135	294	6.21
206	151.262	337	730	6.21
1118	896.795	1999	4336	6.20
1409	295.512	658	1428	6.20
900	168.220	375	814	6.19
HP185	12.498	27	60	6.19
HP195	12.498	27	60	6.19
107	142.758	318	691	6.19
509	144.163	321	699	6.18
526	359.784	802	1747	6.17
520	734.968	1638	3572	6.17
1750	118.128	263	573	6.17
1111	91.104	203	442	6.17
408	135.018	301	656	6.16
1120	320.867	715	1564	6.15
125	135.608	302	661	6.14
1770	6.400	14	31	6.14
HP57	100.523	224	491	6.14
214	548.184	1222	2678	6.13
1115	82.219	183	401	6.13
315	291.705	650	1431	6.11
326	910.911	2031	4471	6.11

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
424	144.903	323	711	6.10
19	307.671	686	1514	6.09
HP560	45.800	102	225	6.09
HP175	12.869	28	63	6.09
422	1,142.192	2547	5620	6.09
60	24.077	53	118	6.08
910	616.356	1374	3037	6.08
1207	131.626	293	649	6.08
1100	97.794	218	483	6.06
14	15.718	35	77	6.06
417	1,080.268	2408	5346	6.06
1404	350.820	782	1735	6.06
HP145	15.147	33	75	6.05
1005	14.719	32	73	6.03
HP135	11.931	26	59	6.02
63	15.875	35	79	6.01
111	1,183.302	2638	5908	6.00
HP550	26.646	59	133	5.98
HP170	7.279	16	36	5.97
119	345.320	770	1736	5.96
316	1,057.470	2358	5323	5.95
1611	38.330	85	193	5.94
1403	538.982	1201	2725	5.93
1107	351.082	782	1777	5.92
416	400.662	893	2029	5.92
323	994.609	2217	5060	5.89
217	1123.919	2506	5721	5.89
320	493.112	1099	2507	5.89
898	54.737	122	279	5.88
1309	830.106	1851	4234	5.88
11	271.904	606	1385	5.88
1105	516.948	1152	2637	5.88
751	1,803.976	4022	10854	5.88
102	1,163.974	2595	5930	5.88
412	1,403.592	3130	7173	5.87
1208	127.226	283	649	5.87
308	1038.435	2315	5316	5.85
1606	1,919.967	4281	9850	5.84
HP155	29.052	64	149	5.83
1610	12.726	28	65	5.83
20	1,160.204	2587	5961	5.83
501	314.263	700	1616	5.83
2	880.779	1964	4539	5.82
309	1147.564	2559	5914	5.82
407	1,045.620	2331	5383	5.82
118	999.027	2227	5153	5.81
313	1,335.360	2977	6891	5.81

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
312	954.404	2128	4932	5.80
101	1,202.364	2681	6214	5.80
S1210	67.724	151	352	5.76
1301	1,134.810	2530	5907	5.76
233	511.127	1139	2659	5.76
327	1,084.457	2418	5655	5.75
18	242.150	539	1263	5.75
127	495.125	1104	2587	5.74
1755	118.460	264	618	5.74
403	136.393	304	713	5.73
59	6.025	13	31	5.73
423	469.586	1047	2455	5.73
114	500.711	1116	2681	5.72
321	988.352	2204	5179	5.72
1340	15.916	35	83	5.69
516	581.220	1296	3067	5.68
1780	3.998	8	21	5.68
1104	532.802	1188	2811	5.68
HP140	13.770	30	72	5.67
318	1,047.826	2336	5549	5.66
216	453.568	1011	2410	5.64
54	1,117.488	2491	5955	5.62
213	757.646	1689	4053	5.60
1612	63.558	141	340	5.60
1211	330.629	737	1775	5.58
1004	24.089	53	129	5.58
15	521.172	1162	2815	5.55
1410	669.289	1492	3623	5.54
HP1016	6.904	15	37	5.54
80	155.109	345	840	5.53
1041	269.772	601	1466	5.52
1401	147.797	329	803	5.51
1304	430.093	959	2348	5.49
302	341.879	762	1867	5.49
HP301	30.994	69	169	5.48
1200	1,475.512	3290	8073	5.48
225	867.513	1934	4746	5.48
1114	33.411	74	183	5.46
1607	390.553	870	2145	5.46
518	180.094	401	991	5.44
1202	1,824.319	4068	10042	5.44
223	388.645	866	2152	5.41
HP275	14.677	32	81	5.37
1	1,920.164	4281	10722	5.37
905	655.676	1462	3696	5.32
500	771.469	1720	4392	5.26
43	136.072	303	777	5.24

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
401	813.543	1814	4695	5.19
1500	114.629	255	663	5.18
16	68.324	152	395	5.18
HP285	15.058	33	87	5.18
HP255	15.897	35	92	5.15
HP295	15.397	34	89	5.13
HP265	15.397	34	89	5.13
300	727.147	1621	4271	5.10
HP105	9.982	22	58	5.08
39	4.893	10	29	5.04
HP267	16.956	37	101	5.03
1300	343.926	766	2054	5.02
115	650.476	1450	3887	5.01
1302	41.635	92	251	4.96
425	402.789	898	2450	4.93
HP115	27.049	60	164	4.92
201	645.777	1440	4029	4.80
1002	11.194	24	70	4.75
1316	47.197	105	305	4.64
HP125	10.575	23	68	4.60
1601	1,163.733	2595	7908	4.41
66	62.045	138	445	4.18
527	355.291	792	2553	4.17
1706	21.767	48	156	4.17
901	506.663	1129	3646	4.16
1108	1,528.399	3408	11112	4.12
904	172.102	383	1278	4.03
506	265.015	590	2118	3.75
519	664.537	1481	5810	3.43
1502	1,243.791	2773	11074	3.36
517	401.730	895	3859	3.12
58	27.119	60	264	3.07
502	618.316	1378	6398	2.89
523	502.959	1121	5240	2.87
507	475.724	1060	5020	2.84
511	419.296	935	4724	2.66
89	287.573	641	3429	2.51
510	396.988	885	4751	2.50
515	391.964	874	4845	2.42
84	371.348	828	4877	2.28
503	345.734	770	4614	2.24
1117	14.960	33	200	2.23
62	299.738	668	4090	2.19
460	239.179	533	3290	2.18
514	335.610	748	4702	2.14
1771	17.897	39	261	2.05
1775	0.000	0	0	0

TABLE 5.1-9
ECO RANKING - HADNOT POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
1613	0.000	0	0	0
27	0.000	0	0	.0
TOTAL	113,487.252	253077	598027	5.69

TABLE 5.1-10
ECO RANKING - PARADISE POINT
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
2617	75.599	219	223	16.53
2628	63.248	184	192	16.03
2626	287.365	836	1448	9.68
2609	26.028	75	134	9.45
2615	1107.467	3222	6051	8.93
2627	436.846	1271	2577	8.27
2629	31.766	92	192	8.03
2611	36.358	105	222	7.96
2600	42.630	124	289	7.17
2604	26.916	78	215	6.10
2624	615.037	1789	4949	6.06
2605	22.211	64	187	5.79
2602	892.082	2595	7644	5.69
2625	214.818	625	2236	4.68
2603	22.599	65	255	4.32
2613	5.866	17	149	1.91
2607	3.780	11	137	1.34
TOTAL	3910.616	11380	27100	5.65

TABLE 5.1-11
ECO RANKING - FRENCH CREEK
PIPE INSULATION

BLDG.	ENERGY SAVINGS MBTU/YR	$/YR	CAPITAL COST	SIR
FC560	133.715	298	400	10.00
FC530	107.421	239	357	9.01
FC555	107.421	239	357	9.01
FC515	94.066	209	350	8.04
FC540	177.863	396	704	7.57
FC525	85.289	190	350	7.29
FC550	85.289	190	350	7.29
FC573	27.685	61	116	7.15
FC565	83.424	186	350	7.13
FC360	54.276	121	261	6.23
FC306	29.060	64	147	5.92
FC520	95.408	212	417	6.85
FC200	52.523	117	273	5.76
FC313	35.721	79	187	5.70
FC301	27.618	61	146	5.66
FC416	50.234	112	270	5.58
FC100	26.382	58	142	5.54
FC400	29.172	65	161	5.41
FC311	21.979	49	128	5.11
FC310	21.979	49	128	5.11
FC309	22.576	50	134	5.04
FC412	45.989	102	287	4.79
FC190	4.200	9	26	4.75
FC303	576.493	1285	3808	4.54
FC304	16.123	35	115	4.17
FC302	169.093	377	1347	3.76
FC415	27.163	60	221	3.67
FC420	293.528	654	2590	3.39
FC411	22.164	49	208	3.19
FC414	22.164	49	208	3.19
FC305	48.020	107	472	3.04
FC251	7.317	16	79	2.77
FC300	125.709	280	1649	2.28
FC312	82.236	183	1733	1.42
FC364	3.478	7	99	1.05
FC413	5.797	12	165	1.05
FC241	0.000	0	0	0.00
TOTAL	2818.575	6285	18735	4.50

TABLE 5.1-12
COMBINED CONTROLS

INSTALLATION	BLDG. NO.	ENERGY SAVINGS MBTU/YR.	$/YR	CAPITOL COST $	SIR
HOSPITAL POINT	H15A	2,265.999	5,053	5,441	9.42
	H17A	195.841	437	1,814	2.44
	H17	180.823	403	1,814	2.26
	H21	107.355	239	1,814	1.34
	H19	95.151	212	1,814	1.19
	H18	93.027	207	1,814	1.16
TOTAL		2,938.196	6,552	14,511	4.58
HADNOT POINT	1502	760.708	1,696	1,814	9.49
	915	665.554	1,484	1,814	8.30
	1201	643.165	1,434	1,814	8.02
	1118	619.965	1,383	1,814	7.73
	907	605.357	1,350	1,814	7.55
	904	575.558	1,283	1,814	7.18
	1012	571.822	1,275	1,814	7.13
	1212	655.303	1,461	2,107	7.04
	1116	655.018	1,461	2,107	7.03
	1317	624.984	1,394	2,107	6.71
	902	653.975	1,458	2,217	6.67
	909	531.828	1,186	1,814	6.63
	1301	648.688	1,447	2,217	6.62
	1011	640.499	1,428	2,217	6.54
	1316	595.973	1,329	2,107	6.40
	1117	595.509	1,328	2,107	6.39
	1775	573.683	1,279	2,107	6.16
	916	554.902	1,237	2,107	5.96
	1601	400.044	892	1,814	4.99
	1108	389.877	869	1,814	4.86
	901	668.343	1,490	3,426	4.41
	905	324.039	723	1,814	4.04
	914	308.381	688	1,814	3.85
	1211	275.918	615	1,814	3.44
	1114	241.703	539	1,814	3.01
	84	278.316	621	2,217	2.84
	1	214.913	479	1,814	2.68
	509	250.989	560	2,217	2.56
	206	249.130	556	2,217	2.54
	424	248.664	555	2,217	2.54
	107	248.398	554	2,217	2.53
	226	247.760	553	2,217	2.53
	307	247.229	551	2,217	2.52
	1500	197.804	441	1,814	2.47
	1202	434.637	969	4,232	2.32
	1450	216.279	482	2,107	2.32
	1780	215.224	480	2,107	2.31
	1120	164.435	367	1,814	2.05

TABLE 5.1-12
COMBINED CONTROLS

INSTALLATION	BLDG. NO.	ENERGY SAVINGS MBTU/YR.	$/YR	CAPITOL COST $	SIR
	1771	185.157	413	2,107	1.99
	15	169.797	379	2,107	1.82
	900	141.318	315	1,814	1.76
	1200	202.112	451	2,620	1.75
	500	166.935	372	2,217	1.70
	54	178.185	397	2,620	1.54
	1401	147.583	329	2,217	1.51
	908	196.698	439	3,023	1.47
	1403	111.584	249	1,814	1.39
	751	205.972	459	3,426	1.36
	1707	108.171	241	1,814	1.35
	1005	123.417	275	2,107	1.33
	420	105.048	234	1,814	1.31
	59	147.704	329	2,620	1.28
	2	102.095	228	1,814	1.27
	1101	367.750	820	6,650	1.25
	1041	277.040	618	5,038	1.24
	314	118.374	264	2,217	1.21
	106	116.397	260	2,217	1.19
	508	110.515	246	2,107	1.19
	1015	108.393	242	2,107	1.16
	1209	107.956	241	2,107	1.16
	1220	93.226	208	1,814	1.16
	1750	112.514	251	2,217	1.15
	1612	89.535	200	1,814	1.12
	1404	87.124	194	1,814	1.09
	25	86.989	194	1,814	1.08
	1309	86.024	192	1,814	1.07
	1302	84.373	188	1,814	1.05
	1310	84.563	189	1,814	1.05
	1409	83.899	187	1,814	1.05
	66	95.835	214	2,107	1.03
	412	81.958	183	1,814	1.02
	1410	82.009	183	1,814	1.02
	1606	245.785	548	5,441	1.02
	1607	80.797	180	1,814	1.01
TOTAL		21,887.406	48,810	165,925	2.98
AIR STATION	AS424	403.190	1,173	2,217	5.37
	AS215	279.746	814	1,814	4.56
	AS216	277.354	807	1,814	4.51
	AS4110	251.844	733	1,814	4.10
	AS4158	241.095	702	2,107	3.38
	AS217	277.989	809	2,620	3.13
	AS130	115.831	337	1,814	1.89
	AS202	135.524	394	2,217	1.80

TABLE 5.1-12
COMBINED CONTROLS

INSTALLATION	BLDG. NO.	ENERGY SAVINGS MBTU/YR.	$/YR	CAPITOL COST $	SIR
	AS118	118.306	344	2,217	1.57
	AS124	103.130	300	2,217	1.37
	AS4146	88.657	258	2,107	1.24
	AS122	91.845	267	2,217	1.22
	AS236	62.866	183	1,814	1.02
TOTAL		2,447.377	7,122	26,989	2.68
BEACH AREA	BA102	197.062	573	1,814	3.21
	BA104	249.557	726	3,591	2.05
	BA105	180.868	526	3,426	1.56
TOTAL		627.487	1,826	8,831	2.10
RIFLE RANGE	RR11	234.271	682	1,814	3.81
	RR1	105.654	307	1,173	3.01
	RR5	105.878	308	1,173	3.01
	RR2	103.797	302	1,173	2.95
	RR4	97.647	284	1,173	2.78
	RR9	49.622	144	1,173	1.41
	RR8	76.185	222	1,814	1.24
	RR3	108.925	317	2,620	1.23
TOTAL		881.979	2567	12,113	2.15
FRENCH CREEK	FC100	751.471	1,676	4,635	3.67
	FC303	156.861	350	2,107	1.68
	FC200	207.801	463	3,023	1.56
	FC241	109.732	245	2,107	1.18
	FC251	160.532	358	3,426	1.06
	FC302	80.660	180	1,814	1.01
TOTAL		1,467.057	3,272	17,405	1.91
CAMP JOHNSON	M424	160.131	466	2,106	2.24
	M324	210.156	612	3,023	2.05
	M202	111.514	325	1,814	1.82
	M129	132.325	385	2,217	1.76
	M132	94.363	275	1,814	1.54
	M128	106.148	309	2,107	1.49
	M134	104.343	304	2,217	1.39
	M101	120.895	352	2,620	1.36
	M326	74.022	215	1,814	1.20
	M303	77.344	225	2,217	1.03
TOTAL		1,191.241	3,467	21,949	1.60

TABLE 5.1-12
COMBINED CONTROLS

INSTALLATION	BLDG. NO.	ENERGY SAVINGS MBTU/YR.	ENERGY SAVINGS $/YR	CAPITOL COST $	SIR
CAMP GEIGER	TC846	95.408	278	1,814	1.56
	TC910	94.456	275	2,620	1.06
TOTAL		189.864	553	4,434	1.26
COURTHOUSE BAY	BB51	171.739	500	1,814	2.80
	BB52	82.070	239	1,814	1.34
	BB28	72.165	210	1,814	1.17
	BB50	79.448	231	2,107	1.11
	BB54	65.144	190	1,814	1.06
TOTAL		470.566	1,369	9,363	1.48
PARADISE POINT	2624	71.189	207	1,814	1.16
TOTAL		71.189	207	1,814	1.16

5.2 ECO PACKAGES

Introduction - The purpose of this section is to present the improvement projects that will reduce energy consumption and costs at this installation.

Improvement Projects - The ECOs have been grouped into projects based upon similarity of improvement. The preliminary project grouping at this installation is shown on Table 5.2-1, ECO Packages. The ECIP forms for these projects are also included.

TABLE 5.2-1
ECO PACKAGES

PACKAGE	ENERGY MBTU/YR	SAVINGS $/YR	CAPITAL COST $	SIR
PIPE INSULATION - CAMP GEIGER (PACKAGE 1)	18,335.774	53,357	88,348	8.12
PIPE INSULATION - HOSPITAL POINT	47,366.701	105,621	176,033	8.07
SYPHON JET SUMP PUMPS	0	193,600	187,200	7.80
PIPE INSULATION - HADNOT POINT (PACKAGE 1)	29,133.814	64,968	113,684	7.69
PIPE INSULATION - RIFLE RANGE & BEACH AREA	15,996.439	46,550	85,890	7.29
PIPE INSULATION - CAMP JOHNSON	16,839.867	49,004	103,385	6.37
PIPE INSULATION - HADNOT POINT (PACKAGE 2)	21,655.238	48,291	104,321	6.26
PIPE INSULATION - HADNOT POINT (PACKAGE 3)	19,953.834	44,497	102,959	5.81
PIPE INSULATION - NEW RIVER AIR STATION	15,178.842	44,170	101,880	5.83
PIPE INSULATION - CAMP GEIGER (PACKAGE 2)	9,520.206	27,704	64,906	5.74
PIPE INSULATION - HADNOT POINT (PACKAGE 4)	19,795.461	44,144	103,129	5.76
PIPE INSULATION - FRENCH CREEK, COURTHOUSE BAY, & PARADISE POINT	14,547.092	35,099	88,605	5.32
PIPE INSULATION - HADNOT POINT (PACKAGE 5)	13,928.926	31,062	81,978	5.09
PIPE INSULATION - HADNOT POINT (PACKAGE 6)	9,019.979	20,115	91,956	2.94
COMBINED CONTROLS HADNOT POINT	21,887.809	48,810	165,925	3.0
COMBINED CONTROLS ALL EXCEPT HADNOT POINT	10,284.950	26,934	121,037	2.26
TOTAL	283,444.932	883,926	1,781,236	

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	CAMP GEIGER PACKAGE 1		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	88,348
B. SIOH		4,859
C. DESIGN COST		5,301
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		88,657
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	88,657

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	18,336	53,357	13.5	720,321
F. TOTAL	$	18,336	53,357		720,321

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 237,706
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 53,379

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 720,524

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 8.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HOSPITAL POINT		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	176,033
B. SIOH		9,682
C. DESIGN COST		10,562
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		176,649
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	176,649

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	47,367	105,628	13.5	1,425,975
F. TOTAL	$	47,367	105,628		1,425,975

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 470,572
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 105,650

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 1,426,177

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 8.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	SYPHON JET SUMP PUMPS	FISCAL YEAR:	1988
PORTION NAME:	STEAM MANHOLES		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	468
B. SIOH		26
C. DESIGN COST		28
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		470
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	470

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	0	0	0	0
F. TOTAL	$	0	0		0

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	484
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	3,681

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 3,681

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 0
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F ERR
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 484

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 3,681

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 1		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	113,684
B. SIOH		6,253
C. DESIGN COST		6,821
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		114,082
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	114,082

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	29,134	64,968	13.5	877,073
F. TOTAL	$	29,134	64,968		877,073

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 289,434
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 64,991

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 877,276

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	RIFLE RANGE & BEACH AREA		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	85,890
B. SIOH		4,724
C. DESIGN COST		5,153
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		86,191
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	86,191

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	15,996	46,550	13.5	628,419
F. TOTAL	$	15,996	46,550		628,419

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 207,378
a. IF 3D1 IS => 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS => 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 46,572

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 628,621

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 7.3

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	CAMP JOHNSON		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	103,385
B. SIOH		5,686
C. DESIGN COST		6,203
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		103,747
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	103,747

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	16,840	49,004	13.5	661,554
F. TOTAL	$	16,840	49,004		661,554

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 218,313
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 49,026

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 661,757

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 6.4

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 2		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	104,321
B. SIOH		5,738
C. DESIGN COST		6,259
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		104,686
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	104,686

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	21,655	48,291	13.5	651,931
F. TOTAL	$	21,655	48,291		651,931

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 215,137
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 48,314

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 652,134

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 6.2

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 3		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	102,959
B. SIOH		5,663
C. DESIGN COST		6,178
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		103,319
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	103,319

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	19,954	44,497	13.5	600,710
F. TOTAL	$	19,954	44,497		600,710

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 198,234
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 44,519

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 600,913

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	NEW RIVER AIR STATION		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	101,880
B. SIOH		5,603
C. DESIGN COST		6,113
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		102,237
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	102,237

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	15,179	44,170	13.5	596,301
F. TOTAL	$	15,179	44,170		596,301

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 196,779
a. IF 3D1 IS => 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS => 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 44,193

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 596,504

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	CAMP GEIGER PACKAGE 2		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	64,906
B. SIOH		3,570
C. DESIGN COST		3,894
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		65,133
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	65,133

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.91	9,520	27,704	13.5	374,001
F. TOTAL	$	9,520	27,704		374,001

3. NON ENERGY SAVINGS (+) / COST (-)
A. ANNUAL RECURRING (+/-) $ 22
(1) DISCOUNT FACTOR (TABLE 1) 9.08
(2) DISCOUNTED SAVING/COST (3AX3A1) $ 203
B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 123,420
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 27,726

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 374,204

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.7

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 4		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	103,129
B. SIOH		5,672
C. DESIGN COST		6,188
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		103,490
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	103,490

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	19,795	44,144	13.5	595,942
F. TOTAL	$	19,795	44,144		595,942

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 196,661
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 44,166

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 596,145

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.8

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: CAMP LEJEUNE
PROJECT TITLE: PIPE INSULATION
PORTION NAME: FR. CK.,CTHSE. BAY & PAR. PT.
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 25
PREPARED BY: LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	88,605
B. SIOH		4,873
C. DESIGN COST		5,316
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		88,915
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	88,915

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. COAL	2.23	10,636	23,719	13.5	320,211
E. COAL	2.91	3,911	11,380	13.5	153,629
F. TOTAL	$	14,547	35,099		473,840

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 156,367
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 35,122

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 474,043

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.3

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 5		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	81,978
B. SIOH		4,509
C. DESIGN COST		4,919
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		82,265
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	82,265

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	13,929	31,062	13.5	419,330
F. TOTAL	$	13,929	31,062		419,330

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 138,379
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 31,084

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 419,533

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 5.1

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	PIPE INSULATION	FISCAL YEAR:	1988
PORTION NAME:	HADNOT POINT PACKAGE 6		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	25
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	91,956
B. SIOH		5,058
C. DESIGN COST		5,517
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		92,278
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	92,278

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	9,020	20,115	13.5	271,546
F. TOTAL	$	9,020	20,115		271,546

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		9.08
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	203

B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 203

D. PROJECT NON ENERGY QUALIFICATION TEST

(1) 25% MAX NON ENERGY CALC (2F5 X .33)		$	89,610
a. IF 3D1 IS = > 3C	GO TO ITEM 4		
b. IF 3D1 IS < 3C	CALC SIR = (2F5+3D1)/1F		0
c. IF 3D1b IS = > 1	GO TO ITEM 4		
d. IF 3D1b IS < 1	PROJECT DOES NOT QUALIFY		

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 20,137

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 271,749

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.9

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION: CAMP LEJEUNE
PROJECT TITLE: COMBINED CONTROLS
PORTION NAME: HADNOT POINT
REGION NUMBER: 4
ANALYSIS DATE: JUNE 23 1987

PROJECT NO.
FISCAL YEAR: 1988
ECONOMIC LIFE IN YEARS: 15
PREPARED BY: LO SUNDE

1. INVESTMENT COST
   A. CONSTRUCTION COST $ 165,925
   B. SIOH 9,126
   C. DESIGN COST 9,956
   D. ENERGY CREDIT CALC (1A+1B+1C)X.9 166,506
   E. SALVAGE VALUE OF EXISTING EQUIPMENT 0
   F. TOTAL INVESTMENT (1D-1E) $ 166,506

2. ENERGY SAVINGS (+) / (-)
   ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. NG	0	0	0	0	0
E. COAL	2.23	21,888	48,810	10.18	496,884
F. TOTAL	$	21,888	48,810		496,884

3. NON ENERGY SAVINGS (+) / COST (-)
   A. ANNUAL RECURRING (+/-) $ 0
      (1) DISCOUNT FACTOR (TABLE 1) 7.61
      (2) DISCOUNTED SAVING/COST (3AX3A1) $ 0
   B. NON RECURRING SAVINGS (+) / COST (-)

ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.	0	0	1	0
b.	0	0	1	0
c.	0	0	1	0
d. TOTAL	0			0

   C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 0

   D. PROJECT NON ENERGY QUALIFICATION TEST
   (1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 163,972
      a. IF 3D1 IS = > 3C GO TO ITEM 4
      b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
      c. IF 3D1b IS = > 1 GO TO ITEM 4
      d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 48,810

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 496,884

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 3.0

LIFE CYCLE COST ANALYSIS SUMMARY
ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

LOCATION:	CAMP LEJEUNE	PROJECT NO.	
PROJECT TITLE:	COMBINED CONTROLS	FISCAL YEAR:	1988
PORTION NAME:	ALL CAMPS EXCEPT HADNOT PT.		
REGION NUMBER:	4	ECONOMIC LIFE IN YEARS:	15
ANALYSIS DATE:	JUNE 23 1987	PREPARED BY:	LO SUNDE

1. INVESTMENT COST

A. CONSTRUCTION COST	$	121,037
B. SIOH		6,657
C. DESIGN COST		7,262
D. ENERGY CREDIT CALC (1A+1B+1C)X.9		121,461
E. SALVAGE VALUE OF EXISTING EQUIPMENT		0
F. TOTAL INVESTMENT (1D-1E)	$	121,461

2. ENERGY SAVINGS (+) / (-)
ANALYSIS DATE ANNUAL SAVINGS, UNIT COST $ DISCOUNTED SAVINGS

FUEL	COST $/MBTU(1)	SAVINGS MBTU/YR(2)	ANNUAL $ SAVINGS (3)	DISCOUNT FACTOR(4)	DISCOUNTED SAVINGS(5)
A. ELEC	8.15	0	0	0	0
B. DIST	0	0	0	0	0
C. RESID	0	0	0	0	0
D. COAL	2.23	4,405	9,824	10.18	100,005
E. COAL	2.91	5,880	17,110	10.18	174,179
F. TOTAL	$	10,285	26,934		274,184

3. NON ENERGY SAVINGS (+) / COST (-)

A. ANNUAL RECURRING (+/-)	$	22
(1) DISCOUNT FACTOR (TABLE 1)		7.61
(2) DISCOUNTED SAVING/COST (3AX3A1)	$	170

B. NON RECURRING SAVINGS (+) / COST (-)

	ITEM	SAVING $ (+) COST $ (-)(1)	YEAR OF OCCURRENCE(2)	DISCOUNT FACTOR (3)	DISCOUNTED SAVINGS (+) COST(-) (4)
a.		0	0	1	0
b.		0	0	1	0
c.		0	0	1	0
d.	TOTAL	0			0

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+),COST(-) (3A2+3Bd4) 170

D. PROJECT NON ENERGY QUALIFICATION TEST
(1) 25% MAX NON ENERGY CALC (2F5 X .33) $ 90,481
a. IF 3D1 IS = > 3C GO TO ITEM 4
b. IF 3D1 IS < 3C CALC SIR = (2F5+3D1)/1F 0
c. IF 3D1b IS = > 1 GO TO ITEM 4
d. IF 3D1b IS < 1 PROJECT DOES NOT QUALIFY

4. FIRST YEAR DOLLAR SAVINGS [2F3+3A+(3B1d/YRS ECONOMIC LIFE)] $ 26,956

5. TOTAL NET DISCOUNTED SAVINGS (2F5+3C) $ 274,354

6. SIR (IF < 1 PROJECT DOES NOT QUALIFY) SIR = (5/1F) = 2.3

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6.0 PRELIMINARY DD 1391 FOR RECOMMENDED PROJECT

6.1 INTRODUCTION

The first page of the DD1391's for the packages described in Section 5.2, "ECO packages" are presented in this Section.

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			126.76

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 1)	L.S.	-	-	113.684
SIOH (5.5%)				6.253
Total Funded Cost				119.937
Unfunded Cost (Design 6%)				6.821
Total Project Cost (FY87)				126.758

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 1220, 211, 3, 9, 307, 916, 1042, 1012, 221, 325, 322, 1101, 907, 25, 1116, 1140, 521, 1011, 122, 411, 1317, 10, 1015, 67, 4, 50, 12, 304, 524, HP405, 914, 1201, 908, HP51, 236, 1006, 1103, 8, 1310, 117, 1400, 6, 317, 400, HP215, 1707, S86, 540, and 909

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 29,133.8 MBtu of energy and $64,968 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 7.69 over a 25 year life.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			116.32

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 2)	L.S.	-	-	104.321
SIOH (5.5%)				5.738
Total Funded Cost				110.059
Unfunded Cost (Design 6%)				6.259
Total Project Cost (FY87)				116.318

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 1450, 314, HP165, 219, 13, 420, 915, 203, HP127, 114, 1106, 205, 17, 65, 1407, 127, 106, 902, 226, 41, 508, 419, S96, 1212, 206, 1118, 1409, 900, 107, HP195, HP185, 509, 1120, 526, 1750, 520, 1111, 408, 123, 1770, HP57, 125, 1115, 214, 326, 315, 424, HP560, HP175, 19, 60, 422, 1207, and 910.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 21,655.2 MBtu of energy and $48,291 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 6.2 over a 25 year life.

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			114.80

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 3)	L.S.	-	-	102.959
SIOH (5.5%)				5.663
Total Funded Cost				108.622
Unfunded Cost (Design 6%)				6.178
Total Project Cost (FY87)				114.800

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 1404, 417, 1100, 14, HP145, 1005, HP135, 63, 111, 119, HP550, HP170, 316, 1611, 1209, 416, 1107, 1403, 1208, 320, 323, 217, 898, 1309, 102, 11, 1105, 751, 412, 308, 1606, 20,501, HP155, 1610, and 2.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 19,953.8 MBtu of energy and $44,497 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.8 over a 25 year life.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION
Marine Corps Base
Camp Lejeune, North Carolina

4. PROJECT TITLE
Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			114.99

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 4)	L.S	-	-	103.129
SIOH (5.5%)				5.672
Total Funded Cost				108.801
Unfunded Cost (Design 6%)				6.188
Total Project Cost (FY87)				114.989

10. DESCRIPTION OF PROPOSED CONSTRUCTION
Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 407, 309, 118, 313, 101, 312, 233, 1301, S1210, 327, 18, 423, 1755, 403, 59, 321, 1104, 1340, 1780, 516, HP140, 318, 216, 54, 213, 1612, 1211, 1004, 15, 1410, HP1016, 80, 1041, 1401, 1304, 302, and 225.

11.
REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 19,795.5 MBtu of energy and $44,144 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.8 over a 25 year life.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			91.41

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 5)	L.S.	-	-	81.978
SIOH (5.5%)				4.509
Total Funded Cost				86.487
Unfunded Cost (Design 6%)				4.919
Total Project Cost (FY87)				91.406

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 1200, HP301, 1114, 1607, 518, 1202, 223, HP275, 1, 905, 500, 43, 401, HP285, 16, 1500, HP255, HP265, HP295, 300, HP105, 39, HP267, 115, 1300, 1302, 425, HP115, 201, 1002, 1316, HP125, 1601, 66, 1706, 527, and 901.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 13,928.9 MBtu of energy and $31,062 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.1 over a 25 year life.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			102.53

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hadnot Point Package 6)	L.S	-	-	91.956
SIOH (5.5%)				5.058
Total Funded Cost				97.014
Unfunded Cost (Design 6%)				5.517
Total Project Cost (FY87)				102.531

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: 1108, 904, 506, 519, 1502, 517, 58, 502, 523, 507, 511, 89, 510, 515, 84, 1117, 503, 62, 460, 514, and 1771.

11.
REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.

IMPACT IF NOT PROVIDED: 9020.0 MBtu of energy and $20,115 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 2.9 over a 25 year life.

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S/N 0102-LF-001-3910 © U.S. Government Printing Office: 1983—000-104/0007 2-1

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			115.27

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Camp Johnson)	L.S.	-	-	103.385
SIOH (5.5%)				5.686
Total Funded Cost				109.071
Unfunded Cost (Design 6%)				6.203
Total Project Cost (FY87)				115.274

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: M90, M100, M101, M102, M103, M104, M105, M112, M116, M123, M124, M125, M126, M127, M128, M129, M130, M131, M132, M134, M139, M178, M201, M202, M205, M206, M207, M208, M209, M210, M215, M216, M231, M237, M240, M301, M302, M303, M305, M307, M308, M309, M311, M313, M314, M315, M316, M318, M319, M321, M323, M324, M326, M327, M401, M402, M403, M405, M406, M407, M408, M409, M411, M412, M413, M414, M415, M416, M418, M419, M420, M422, M424, M441, M501, M502, M503, M504, M506, M507, M509, M511, M512, M513, M514, M516, M518, M520, M521, M522, M601, M602, M603, M604, M606, M607, M609, M611, M612, M613, M614, M616, M619, M620, M621, and M622.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 16,839.9 MBtu of energy and $49,004 will continue to be wasted each year.

(Continued)

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11. Continued

ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 6.4 over a 25 year life.

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			98.51

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Camp Geiger Package 1)	L.S.	-	-	88.348
SIOH (5.5%)				4.859
Total Funded Cost				93.207
Unfunded Cost (Design 6%)				5.301
Total Project Cost (FY87)				98.508

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: TC740, TC1066, TC845, TC814, TC815, TC1140, TC844, TC841, TC810, TC744, TC1040, TC840, TC715, TC714, TC710, TC711, TC1141, TC1042, TC851, TC1013, TC1050, TC850, TC1063, TC743, TC741, TC834, TC842, TC1010, TC1041, TC832, TC1054, TC1053, TC1059, TC735, TC855, TC1065, TC1067, TC745, TC1143, TC1051, TC1068, TC1162, TC950, TC1016, TC1012, TC1015, TC1004, TC854, TC716, TC829, TC1062, TC1019, TC726, TC828, TC727, TC1038, TC1119, TC846, TC1039, TC1029, TC1131, TC1060, TC808, TC1028, TC1132, TC809, TC1047, TC1018, TC1017, TC709, TC705, TC754, TC706, TC704, TC707, TC708, TC749, TC729, TC1061, TC1044, TC728, TC816, TC1160, TC736, TC1007, TC719, TC817, TC818, TC718, TC819, TC826, TC1046, TC827, TC839, TC836, TC838, TC1049, TC1005, TC1026, TC837, TC738, TC1006, TC739, TC853, and TC848.

11\.

<u>REQUIREMENT</u> N/A <u>ADEQUATE</u> N/A <u>SUBSTANDARD</u> N/A

<u>PROJECT:</u> Upgrade pipe insulation
<u>SPECIFIC PURPOSE:</u> Reduce energy consumption
<u>REQUIREMENT</u>: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

<u>CURRENT SITUATION:</u> Energy is being wasted through poorly insulated steam and condensate lines.

(Continued)

Encl (1)

11. Continued

IMPACT IF NOT PROVIDED: 18,335.774 MBtu of energy and $53,357 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 8.1 over a 25 year life.

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			72.370

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Camp Geiger Package 2)	L.S.	-	-	64.906
SIOH (5.5%)				3.570
Total Funded Cost				68.476
Unfunded Cost (Design 6%)				3.894
Total Project Cost (FY87)				72.370

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: TC1036, TC1037, TC1058, TC1057, TC1048, TC1055, TC1027, TC805, TC1003, TC807, TC804, TC1009, TC1069, TC806, TC951, G530, TC712, TC737, TC910, TC900, TC1052, TC1056, G550, TC701, TC742, G520, G770, TC1110, TC812, TC1008, TC717, TC1142, G640, G540, TC1064, TC748, TC1161, TC753, TC750, TC751, TC752, and TC1045.

11.
REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 9520.206 MBtu of energy and $27,704 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.7 over a 25 year life.

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA			2. DATE 23 June 87
3. INSTALLATION AND LOCATION Marine Corps Base Camp Lejeune, North Carolina			4. PROJECT TITLE Upgrade Pipe Insulation	
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000) 98.79	

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (French Creek, Courthouse Bay and Paradise Point)	L.S.	-	-	88.605
SIOH (5.5%)				4.873
Total Funded Cost				93.478
Unfunded Cost (Design 6%)				5.316
Total Project Cost (FY87)				98.794

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings:

French Creek: FC100, FC190, FC200, FC241, FC251, FC300, FC301, FC302, FC303, FC304, FC305, FC306, FC309, FC310, FC311, FC312,FC313, FC360, FC364, FC400, FC411, FC412, FC413, FC414, FC415, FC416, FC420, FC515, FC520, FC525, FC530, FC540, FC550, FC555, FC365, FC573

Courthouse Bay: BB2, BB5, BB7, BB8, BB10, BB11, BB12, BB13, BB14, BB15, BB16, BB27, BB28, BB45, BB50, BB51, BB52, BB54, BB72, BB250, BB255, BB260, BB265, BB269, BB270

Paradise Point: 2600, 2602, 2603, 2604, 2605, 2607, 2609, 2611, 2613, 2615, 2617, 2624, 2625, 2626, 2627, 2628, 2629

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation

SPECIFIC PURPOSE: Reduce energy consumption

REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines. (Cont.)

11. Continued

IMPACT IF NOT PROVIDED: 14,547.1 MBtu of energy and $35,099 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.3 over a 25 year life.

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			196.28

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Hospital Point)	L.S.	-	-	176.033
SIOH (5.5%)				9.682
Total Funded Cost				185.715
Unfunded Cost (Design 6%)				10.562
Total Project Cost (FY87)				196.277

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: H14, H15A, H16, H17, H17N, H18, H19, H21, H23, H24, H36 and H39.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 47,366.7 MBtu of energy and $105,621 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 8.1 over a 25 year life.

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S/N 0102-LF-001-3910 ☆ U.S. Government Printing Office: 1982—505-104/5887 3-1

1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			95.77

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (Rifle Range and Beach Area)	L.S.	-	-	85.890
SIOH (5.5%)				4.724
Total Funded Cost				90.614
Unfunded Cost (Design 6%)				5.153
Total Project Cost (FY87)				95.767

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings:

Rife Range: RR1, RR2, RR3, RR4, RR5, RR8, RR9, RR10, RR11, RR12

Beach Area: BA101, BA102, BA103, BA104, BA105, BA128

11\.
REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Upgrade pipe insulation
SPECIFIC PURPOSE: Reduce energy consumption
REQUIREMENT: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted through poorly insulated steam and condensate lines.
IMPACT IF NOT PROVIDED: 15,996.4 MBtu of energy and $46,540 will continue to be wasted each year.
ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 7.3 over a 25 year life.

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S/N 0102-LF-001-3910

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1. COMPONENT	FY 1988 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Air Base Camp Lejeune, North Carolina	Upgrade Pipe Insulation

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			113.60

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Pipe Insulation (New River Air Station)	L.S.	-	-	101.880
SIOH (5.5%)				5.603
Total Funded Cost				107.483
Unfunded Cost (Design 6%)				6.113
Total Project Cost (FY87)				113.596

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Upgrade pipe insulation on the Building Steam Distribution System and Condensate Return System in the following buildings: AS114, AS118, AS122, AS124, AS130, AS202, AS205, AS208, AS211, AS212, AS213, AS214, AS215, AS216, AS217, AS222, AS225, AS226, AS232, AS236, AS240, AS302, AS312, AS320, AS414, AS424, AS425, AS502, AS504, AS515, AS518, AS4010, AS4012, AS4015, AS4C20, AS4025, AS4030, AS4035, AS4100, AS4106, AS4108, AS4110, AS4120, AS4122, AS4141, AS4145, AS4146, AS4157, AS4158

11.

<u>REQUIREMENT</u> N/A <u>ADEQUATE</u> N/A <u>SUBSTANDARD</u> N/A

<u>PROJECT:</u> Upgrade pipe insulation
<u>SPECIFIC PURPOSE:</u> Reduce energy consumption
<u>REQUIREMENT:</u> This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

<u>CURRENT SITUATION:</u> Energy is being wasted through poorly insulated steam and condensate lines.
<u>IMPACT IF NOT PROVIDED:</u> 15,178.8 MBtu of energy and $44,170 will continue to be wasted each year.
<u>ADDITIONAL:</u> An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 5.8 over a 25 year life.

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S/N 0102-LF-001-3910 ☆U.S. Government Printing Office: 1982—000-104/8097 3-1

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Replace Steam Manhole Ejectors

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			208.73

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Syphon Jet Sump Pumps	Ea.	400	468	187.200
SIOH (5.5%)				10.296
Total Funded Cost				197.496
Unfunded Cost (Design 6%)				11.232
Total Project Cost (FY87)				208.728

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Replace Existing steam pit and manhole ejector sump pumps which have been discontinued with syphon jet sump pumps.

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Replace Steam Manhole Ejectors.
SPECIFIC PURPOSE: Reduce maintenance costs.
REQUIREMENT: This project will reduce maintenance costs.

CURRENT SITUATION: Excessive maintenance dollars are being spent on maintaining ejector pumps which are unreliable and which have been discontinued by the manufacturer.

IMPACT IF NOT PROVIDED: $193,600 will continue to be wasted each year.

ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 7.8 over 15 year life.

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S/N 0102-LF-001-3910 ☆ U.S. Government Printing Office: 1982—586-186/8897 3-1

1. COMPONENT	FY 19<u>88</u> MILITARY CONSTRUCTION PROJECT DATA	2. DATE 23 June 87

3. INSTALLATION AND LOCATION	4. PROJECT TITLE
Marine Corps Base Camp Lejeune, North Carolina	Install More Efficient HVAC Controls

5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000)
			186.0

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Controls (Night Setback, Outside Air Shutoff, Hot Water Outside Air Reset) (Hadnot Point)	L.S.	-	-	165.925
SIOH (5.5%)				9.126
Total Funded Cost				175.051
Unfunded Cost (Design 6%)				9.956
Total Project Cost (FY87)				186.007

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Install night setback, outside air steam shutoff and hot water outside air reset controls in buildings: (see attached list)

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Install more efficient HVAC controls.

SPECIFIC PURPOSE: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted by inefficient operation of the HVAC systems due to inefficient controls.

IMPACT IF NOT PROVIDED: 21,887.8 MBtu of energy and $48,810 will continue to be wasted each year.

ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 3.0 over a 15 year life.

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INSTALLATION	BLDG. NO.
HADNOT POINT	1502
	915
	1201
	1118
	907
	904
	1012
	1212
	1116
	1317
	902
	909
	1301
	1011
	1316
	1117
	1775
	916
	1601
	1108
	901
	905
	914
	1211
	1114
	84
	1
	509
	206
	424
	107
	226
	307
	1500
	1202
	1450
	1780
	1120
	1771
	15
	900
	1200
	500
	54
	1401
	908

INSTALLATION	BLDG. NO.
	1403
	751
	1707
	1005
	420
	59
	2
	1101
	1041
	314
	106
	508
	1015
	1209
	1220
	1750
	1612
	1404
	25
	1309
	1302
	1310
	1409
	66
	412
	1410
	1606
	1607

1. COMPONENT	FY 19 88 MILITARY CONSTRUCTION PROJECT DATA			2. DATE 23 June 87
3. INSTALLATION AND LOCATION Marine Corps Base Camp Lejeune, North Carolina		4. PROJECT TITLE Install More Efficient HVAC Controls		
5. PROGRAM ELEMENT	6. CATEGORY CODE	7. PROJECT NUMBER	8. PROJECT COST ($000) 134.96	

9. COST ESTIMATES

ITEM	U/M	QUANTITY	UNIT COST	COST ($000)
Controls (Night Setback, Outside Air Shutoff, Hot Water Outside Air Reset) (All Camps Except Hadnot Point)	L.S.	-	-	121.037
SIOH (5.5%)				6.657
Total Funded Cost				127.694
Unfunded Cost (Design 6%)				7.262
Total Project Cost (FY87)				134.956

10. DESCRIPTION OF PROPOSED CONSTRUCTION

Install night setback, outside air steam shutoff and hot water outside air reset controls in buildings: (see attached list)

11.

REQUIREMENT N/A ADEQUATE N/A SUBSTANDARD N/A

PROJECT: Install more efficient HVAC controls.

SPECIFIC PURPOSE: This project will not only save dollars, but will help this installation obtain its scheduled energy goals.

CURRENT SITUATION: Energy is being wasted by inefficient operation of the HVAC systems due to inefficient controls.

IMPACT IF NOT PROVIDED: 10,285.0 MBtu of energy and $26,934 will continue to be wasted each year.

ADDITIONAL: An economic analysis has been prepared for this project. The Savings-to-Investment Ratio (SIR) is 2.3 over a 15 year life.

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S/N 0102-LF-001-3910 ☆U.S. Government Printing Office: 1983—[illegible]

INSTALLATION	BLDG. NO.
HOSPITAL POINT	H15A
	H17A
	H17
	H21
	H19
	H18
AIR STATION	AS424
	AS215
	AS216
	AS4110
	AS4158
	AS217
	AS130
	AS202
	AS118
	AS124
	AS4146
	AS122
	AS236
BEACH AREA	BA102
	BA104
	BA105
RIFLE RANGE	RR11
	RR1
	RR5
	RR2
	RR4
	RR9
	RR8
	RR3
FRENCH CREEK	FC100
	FC303
	FC200
	FC241
	FC251
	FC302
CAMP JOHNSON	M424
	M324
	M202
	M129
	M132

INSTALLATION	BLDG. NO.
	M128
	M134
	M101
	M326
	M303
CAMP GEIGER	TC846
	TC910
COURTHOUSE BAY	BB51
	BB52
	BB28
	BB50
	BB54
PARADISE POINT	2624

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7.0 IDENTIFIED SOURCES OF ENERGY LOSS NOT IN SCOPE OF WORK

7.1 INTRODUCTION

During the field survey, the surveyors detected or were told about other potential sources of energy savings which are not in the Scope of Work. The purpose of this section is to point out these sources and offer possible solutions. These identified sources of energy loss are as follows:

1. Cherry Point Public Works maintenance people have commented on energy losses from fintube heat exchangers which are used to cool the condensate to protect the FRP pipe line from steam in the trap discharge. Camp Lejeune Public Works maintenance people have stated there are problems with the FRP condensate return pipe lines which have resulted in a loss of water and energy from leaks. In systems designed by MAIN for our clients, we have used a piping system called "Ricwil" which has the FRP pipeline inside a rugged PVC pipe. A length (approximately 10 feet) of schedule 40 stainless steel pipe with a sparge tube on the inside, is used to connect the steam trap discharge to the FRP condensate return line. This length of pipe allows the trap condensate to mix with the condensate and cool to the allowable operating temperature for FRP pipe.
2. The architectural features of the buildings may or may not have been surveyed in the past with energy losses being quantified. During the survey, we observed buildings with insufficient insulation, single pan glass, air infiltration, doors standing open in hangers and industrial buildings, 100% make-up air for industrial buildings, etc. These observed conditions may be a source of sufficient energy loss to justify correction or further analysis.
3. Camp Geiger buildings TC1064 through TC1069 have condensate receivers which pump the condensate into the return piping system. This return piping system has about one mile of pipe between the buildings and the condensate return tank at the

boiler house G650. Those buildings which do not have pumped condensate return systems are connected to this same return line. In these buildings with the gravity return system, it is necessary to raise inlet steam pressure to the heat exchangers so that the condensate pressure is high enough to overcome the pressure in the return line. ~~The increased inlet steam pressure is too great for the heat exchanger to operate properly.~~ Therefore, to get proper operation of the heat exchanger, AND STEAM TRAPS the inlet steam pressure must be lowered and the condensate be discharged to the storm drain system. This results in several hundred Btus being lost for every pound of condensate dumped and requires additional treated water for boiler feedwater makeup.

IN DOING SO, THE RAISED INLET STEAM PRESSURE EXCEEDS THE PRESSURE SETTINGS ON THE STEAM TRAPS, CAUSING them to malfuction and blow steam straight Thru.

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APPENDIX

APPENDICES

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DESCRIPTION:

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AIR STATION
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
AS114	HOBBY SHOP	B5/25
AS118	AUTO MAINT SHOP	B5/25
AS122	PW SHOPS	B5/26
AS124	PW SHOPS	B5/25
AS130	GEN WHSE	C1/26
AS202	GYMNASIUM	B5/26
AS205	EX SNACK STD	B5/26
AS208	EM CLUB E1-E5	B5/26
AS211	ADMIN	B5/26
AS212	BEQ E1-E4	C1/26
AS213	BEQ E1-E4	C1/26
AS214	BEQ E1-E4	C1/26
AS215	BEQ E1-E4	C1/26
AS216	ADMIN	C1/26
AS217	ADMIN	C1/26
AS222	APPL INSTR BLDG	C1/31
AS225	MECH ROOM	C1/26
AS226	EM DINING FAC	C1/31
AS232	RETAIL STR EX	B5/31
AS236	CHAPEL	B5/31
AS240	THEATRE	B5/31
AS302	DENTAL CLINIC	B5/31
AS312	APPL INSTR BLDG	C1/32
AS320	OPERATIONAL TR	C1/32
AS414	COMMISSARY	C1/26
AS424	GEN STORAGE	C1/31
AS425	DATA PRO CENTER	C1/32
AS502	FIRE/RESCUE ST	C2/32
AS504	HANGER	C2/31
AS515	HANGER	C2/26
AS518	HANGER	C2/25
AS4010	BEQ E1-E4	C3/23
AS4012	EM DINING FAC	C3/23
AS4015	BEQ E1-E4	C3/23
AS4020	BEQ E1-E4	C2/24
AS4025	BEQ E1-E4	C2/23
AS4030	BEQ E1-E4	C2/23
AS4035	BEQ E1-E4	C3/23
AS4100	HANGER	C3/25
AS4106	HANGER	C4/25
AS4108	HANGER	C4/24
AS4110	GENL STG	C3/25
AS4120	ARMORY	C4/24
AS4122	REG/GROUP HDQ	C4/24
AS4141	AVIONICS	C2/25
AS4145	ARMORY	C2/25
AS4146	GSE SHOP	C2/25
AS4157	ADMIN	C4/23

AIR STATION
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
AS4158	MAINT BUILDING	C4/23

BEACH AREA
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
BA101	LOCATION EXCHANGE	N5/115
BA102	BN SQDRN HDQTRS	N5/115
BA103	EM DINING FAC	P1/114
BA 104	BEQ E1-E4	P1/114
BA105	DISPENSARY	P1/114
BA128	GEN STG A/G/ORG	P1/114

BUILDING LIST
CAMP GEIGER

BUILDING NO.	BUILDING USE	MAP LOC
G520	REG/GROUP HDQ	A2/23
G530	REG/GROUP HDQ	A5/24
G540	DISPENSARY	A5/24
G550	DISPENSARY	A5/24
G640	EM DINING FAC	A5/24
GG770	DISPENSARY	B1/24
TC701	FIRE STATION	B1/23
TC704	REG/GROUP HDQ	B1/23
TC705	REG/GROUP HDQ	B1/23
TC706	REG/GROUP HDQ	B1/23
TC707	BEQ E1-E4	B1/23
TC708	BEQ E1-E4	B1/23
TC709	BEQ E1-E4	B1/23
TC710	LATRINE	B1/23
TC711	LATRINE	B1/23
TC712	LATRINE	B1/23
TC714	LATRINE	B1/23
TC715	PW SHOPS	B1/23
TC716	APPL INSTR BUILDING	B1/23
TC717	BEQ E1-E4	B1/23
TC718	BEQ E1-E4	B1/23
TC719	BEQ E1-E4	B1/23
TC726	CO/BTRY HDQ	B1/23
TC727	BN SQDRN HDQ	B1/23
TC728	ACAD INSTR BUILDING	B1/24
TC729	BEQ E1-E4	B1/24
TC735	COMM CENTER	B1/24
TC736	BEQ E1-E4	B1/24
TC737	BN SQDRN HDQ	B1/24
TC738	BN SQDRN HDQ	B1/24
TC739	BOQ W1-02	B1/24
TC740	LATRINE	B1/24
TC741	LATRINE	B1/24
TC742	LATRINE	B1/24
TC743	LATRINE	B1/24
TC744	LATRINE	B1/24
TC745	BN SQDRN HDQ	B1/24
TC748	SPEC SER ISSUE OFFIC	B1/24
TC749	SPEC ISSUE OFFICE	B1/24
TC750	LIBRARY	B1/24
TC751	COMM CENTER	B1/24
TC752	BOQ W1-02	B1/24
TC753	BN SQDRN HDQ	B1/24
TC754	ADMIN	B1/24
TC804	BEQ E1-E4	B2/23
TC805	BEQ E1-E4	B2/23
TC806	BEQ E1-E4	B2/23
TC807	BEQ E1-E4	B2/23

BUILDING LIST
CAMP GEIGER

BUILDING NO.	BUILDING USE	MAP LOC
TC808	BEQ E1-E4	B2/23
TC809	CO/BTRY HDQ	B2/23
TC810	LATRINE	B2/23
TC812	LATRINE	B2/23
TC814	LATRINE	B2/23
TC815	LATRINE	B2/23
TC816	ARMORY	B2/23
TC817	GEN STORAGE A/G/ORG	B2/23
TC818	BEQ E1-E4	B2/23
TC819	BEQ E1-E4	B2/23
TC826	BEQ E1-E4	B2/23
TC827	BEQ E1-E4	B2/23
TC828	BEQ E1-E4	B1/24
TC829	BEQ E1-E4	B2/24
TC832	PW SHOPS	B2/24
TC834	LAUNDRY	B2/24
TC836	BEQ E1-E4	B2/24
TC837	BEQ E1-E4	B2/24
TC838	BEQ E1-E4	B2/24
TC839	BEQ E1-E4	B2/24
TC840	ADMIN	B2/24
TC841	LATRINE	B2/24
TC842	LATRINE	B2/24
TC844	LATRINE	B2/24
TC845	LATRINE	B2/24
TC846	CO/BTRY HDQ	B1/24
TC848	BEQ E1-E4	B2/24
TC850	LATRINE	B2/24
TC851	LATRINE	B2/24
TC853	CO/BTRY HDQ	B2/24
TC854	REG/GROUP HDQ	B2/24
TC855	ACAD INSTR	B2/24
TC900	THEATRE	B3/23
TC910	LOCATION EXCHANGE	B2/23
TC950	LATRINE	B2/24
TC951	ACAD INSTR BUILDING	B2/24
TC1003	POST OFFICE	B3/23
TC1004	BEQ E1-E4	B3/23
TC1005	BEQ E1-E4	B3/23
TC1006	BEQ E1-E4	B3/23
TC1007	BEQ E1-E4	B3/23
TC1008	BEQ E1-E4	B3/23
TC1009	BEQ E1-E4	B3/23
TC1010	LATRINE	B3/23
TC1012	LATRINE	B3/23
TC1013	LATRINE	B3/23
TC1015	LATRINE	B3/23
TC1016	LATRINE	B3/23

BUILDING LIST
CAMP GEIGER

BUILDING NO.	BUILDING USE	MAP LOC
TC1017	GEN STORAGE	B3/23
TC1018	BEQ E1-E4	B3/23
TC1019	BEQ E1-E4	B3/23
TC1026	BEQ E1-E4	B3/24
TC1027	BEQ E1-E4	B3/24
TC1028	BOQ W1-02	B3/23
TC1029	BN SQDN HDQ	B3/24
TC1036	ACAD INSTR BUILDING	B3/24
TC1037	ACAD INSTR BUILDING	B3/24
TC1038	ACAD INSTR BUILDING	B3/24
TC1039	BEQ E1-E4	B3/24
TC1040	LATRINE	B3/24
TC1041	LATRINE	B3/24
TC1042	LATRINE	B3/24
TC1044	LATRINE	B3/24
TC1045	LATRINE	B3/24
TC1046	ACAD INSTR BUILDING	B3/24
TC1047	BEQ E1-E4	B3/24
TC1048	GEN STORE	B3/24
TC1049	LATRINE	B3/24
TC1050	LATRINE	B3/24
TC1051	GEN STORAGE A/G/ORG	B3/24
TC1052	LATRINE	B3/24
TC1053	GEN STORAGE	B3/24
TC1054	LATRINE	B3/24
TC1055	BEQ	B3/24
TC1056	CO/BTRY HDQ	B3/24
TC1057	GEN STORAGE	B3/24
TC1058	GEN STORAGE	B3/24
TC1059	COMM CENTER	B3/24
TC1060	APPL INSTR BUILDING	B3/25
TC1061	CO/BTRY HDQ	B3/23
TC1062	GEN STORAGE	B3/25
TC1063	BN SQDRN HDQ	B3/25
TC1064	BEQ E6-E9	B3/23
TC1065	BEQ E6-E9	B3/23
TC1066	BEQ E6-E9	B3/23
TC1067	BOQ W1-02	B3/23
TC1068	BOQ W1-02	B3/23
TC1069	BPQ W1-02	B3/23
TC1110	BN SQDRN HDQ	B3/23
TC1119	COMM CENTER	B3/24
TC1131	BEQ E1-E4	B3/24
TC1132	BEQ E1-E4	B3/24
TC1140	LATRINE	B3/24
TC1141	LATRINE	B3/24
TC1142	BEQ E1-E4	B3/24
TC1143	ACAD INSTR BUILDING	B3/24

BUILDING LIST
CAMP GEIGER

BUILDING NO.	BUILDING USE	MAP LOC
TC1160	BOQ W1-02	B3/23
TC1161	BOQ W1-02	B3/23
TC1162	BOQ W1-02	B3/23

CAMP JOHNSON
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
M90	APPL INSTR BUILDING	B3/46
M100	NCO CLUB E4-E5	B1/46
M101	APPL INSTR BUILDING	B2/46
M102	APPL INSTR BUILDING	B2/46
M103	PUBLIC WORKS SHOPS	B2/46
M104	ACAD INSTR BUILDING	B2/46
M105	ADMIN	B2/51
M112	GEN WHSE MC	B1/46
M116	CHAPEL	B1/46
M123	ACAD INSTR BUILDING	B2/46
M124	ACAD INSTR BUILDING	B2/46
M125	ACAD INSTR BUILDING	B2/46
M126	ACAD INSTR BUILDING	B2/46
M127	ACAD INSTR BUILDING	B2/46
M128	BEQ E6-E9	B2/46
M129	GYMNASIUM	B1/45
M130	BEQ E6-E9	B1/45
M131	ADMIN	B1/45
M132	APPL INSTR BUILDING	B1/46
M134	EM CLUB E1-E3	B1/46
M139	CBT TRNG PL/TK	B2/51
M178	WTR TREATMENT FAC	B2/45
M201	APPL INSTR BUILD	B4/44
M202	APPL INSTR BUILD	B4/44
M205	LATRINE	B4/44
M206	LATRINE	B4/44
M207	LATRINE	B4/44
M208	LATRINE	B4/44
M209	LATRINE	B4/44
M210	LATRINE	B4/44
M215	ADMIN	B4/44
M216	ACAD INSTR BUILD	B4/44
M231	BOQ W1-02	B5/43
M237	APPL INSTR BUILD	B5/44
M240	CPO MESS	B5/44
M301	GEN WHSE MC	B1/46
M302	POLICE STATION	B1/46
M303	BEQ E1-E4	B1/46
M305	BEQ E1-E4	B1/46
M307	ACAD INSTR BUILDING	B1/46
M308	ARMORY	B1/51
M309	BEQ E1-E4	B1/51
M311	BEQ E1-E4	B1/51
M313	BEQ E1-E4	B1/51
M314	GEN WHSE MC	B1/51
M441	MECH BLDG.	A5/46
M315	TRHSG/DETACHED	B1/51
M316	BEQ E1-E4	B1/51

CAMP JOHNSON
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
M318	BEQ E1-E4	B1/51
M319	GEN WHSE MC	B1/51
M321	LIBRARY	B1/51
M323	ACAD INSTR BUILDING	B1/51
M324	APPL INSTR BUILDING	B1/51
M326	APPL INSTR BUILDING	B1/51
M327	APPL INSTR BUILDING	B1/51
M401	ADMIN	B1/46
M402	ADMIN	B1/46
M403	ACAD INSTR BUILDING	B1/46
M405	ACAD INSTR BUILDING	B5/46
M406	ACAD INSTR BUILDING	B5/46
M407	APPL INSTR BUILDING	B5/46
M408	GEN WHSE MC	B1/46
M409	APPL INSTR BUILDING	A5/46
M411	APPL INSTR BUILDING	A5/46
M412	ACAD INSTR BUILDING	A5/46
M413	ACAD INSTR BUILDING	A5/46
M414	ADMIN	B1/46
M415	GEN WHSE MC	B1/46
M416	BEQ E1-E4	A5/46
M418	ADMIN	A5/46
M419	ADMIN	A5/46
M420	ACAD INSTR BUILDING	A5/46
M422	APPL INSTR BUILDING	A5/46
M424	EM DINING FAC	A5/51
M501	GEN WHSE MC	A5/52
M502	TRHSG/DETACHED	A5/52
M503	BEQ E1-E4	A5/52
M504	BEQ E1-E4	A5/52
M506	GEN WHSE MC	A5/52
M507	BEQ E1-E4	A5/52
M509	BEQ E1-E4	A5/52
M511	BEQ E1-E4	A5/52
M512	GEN WHSE MC	A5/52
M513	APPL INSTR BUILDING	B1/52
M514	BEQ E1-E4	A5/52
M516	BEQ E1-E4	A5/52
M518	BEQ E1-E4	A5/52
M520	APPL INSTR BUILDING	B1/52
M521	BEQ E1-E4	B1/52
M522	BEQ E1-E4	B1/52
M601	ADMIN	A5/51
M602	DRY CLEANING PL	A5/51
M603	ADMIN	A5/51
M604	BEQ E1-E4	A5/51
M606	GEN WHSE MC	A5/51
M607	BEQ E1-E4	A5/51

CAMP JOHNSON
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
M609	BEQ E1-E4	A5/51
M611	ADMIN	A5/51
M612	ADMIN	A5/51
M613	ADMIN	A5/51
M614	BEQ E1-E4	A5/51
M616	BEQ E1-E4	A5/51
M619	TRKSG/DETACHED	A5/51
M620	ACAD INSTR BUILDING	A5/51
M621	BEQ E1-E4	A5/51
M622	BEQ E1-E4	A5/51

COURTHOUSE BAY
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
BB2	THEATRE/GYM	N2/72
BB5	BN SQDRN HDQTRS	N2/71
BB7	EM DINING FAC	N2/72
BB8	ADMIN	N2/72
BB10	DISPENSARY	N2/71
BB11	BEQ E1-E4	N2/71
BB12	BEQ E1-E4	N2/71
BB13	BEQ E1-E4	N2/72
BB14	BEQ E1-E4	N2/72
BB15	ADMIN	N2/72
BB16	GENL STORAGE	N2/72
BB27	PO MESS	M5/72
BB28	ADMIN	M5/73
BB45	COM OFF MESS	N2/71
BB50	APPL INSTR BLDG	N1/73
BB51	CONST EQ MAINT SHOP	M5/73
BB52	APPL INSTR BLDG	N1/73
BB54	EM CLUM E1-E3	M5/72
BB72	LATRINE	M5/73
BB250	BEQ	M5/72
BB255	BEQ E1-E4	M5/72
BB260	BEQ E1-E16	M5/71
BB265	BEQ E1-E6	M5/71
BB269	MECH ROOM	M4/71
BB270	BEQ E1-E6	M5/71

FRENCH CREEK
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
FC100	AUTO SHOP	G4/91
FC190	FLD MAINT SHOP	G4/91
FC200	CONST EQ M/SHOP	G4/92
FC241	AUTO SHOP	G5/93
FC251	ELEC/COMM MNT SHOP	G5/93
FC300	BN SQDRN HDQ	G5/91
FC301	ARMORY	H1/91
FC302	ARMORY	H1/91
FC303	EM DINING FAC	H1/86
FC304	BEQ E1-E4	H1/91
FC305	BEQ E1-E4	H1/91
FC306	BEQ E1-E4	H1/91
FC309	BEQ E1-E4	H1/86
FC310	BEQ E1-E4	H1/86
FC311	BEQ E-5	H1/86
FC312	ACAD INSTR BUILDING	H1/85
FC313	DISPENSARY	H1/85
FC360	BEQ E1-E4	H1/91
FC364	BN OPR CENTER	H2/86
FC400	CO/BTRY HDQ	H2/85
FC411	BEQ E5	H2/85
FC412	BEQ E	H3/85
FC413	BEQ E1-E4	H2/85
FC414	BEQ E1-E4	H3/85
FC415	BEQ E1-E4	H2/86
FC416	BEQ E5	H3/85
FC420	EM DINING FAC	H3/86
FC515	BEQ E1-E4	H3/84
FC520	BEQ E1-E4	H1/85
FC525	BEQ E1-E4	H3/84
FC530	BEQ E1-E4	H1/85
FC540	EM DINING FAC	H3/84
FC550	BEQ E1-E4	H3/83
FC555	BEQ E1-E4	H3/83
FC560	BEQ E1-E4	H3/83
FC565	BEQ E1-E4	H3/83
FC573	BEQ E1-E4	H3/84

HADNOT POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
1	ADMIN	F5/76
2	DIV/WING HDQ	G2/74
3	POLICE STATION	F3/76
4	LOCATION EX	F3/76
6	BEQ E1-E4	F4/76
8	CO/BTRY HDQ	F4/76
9	EM DINING FAC	F4/76
10	DIV/WING HDQ	F4/76
11	GEN WHSE	F4/76
12	BEQ E1-E4	F5/76
13	ADMIN	F5/76
14	RED CROSS/NAVY RLF	G1/81
15	DISPENSARY	F5/81
16	CHAPEL	G1/81
17	CHAPEL	F2/75
18	FIRE STATION	F2/74
19	THEATER	F3/75
20	WTR TRMNT FAC	F5/76
27	ADMIN	F5/76
39	SQUASH COURT	G2/81
41	RED CROSS NAVY RLF	F2/75
43	COBBLER SHOP & M.P.STA	F3/76
50	ADMIN	F4/81
54	PHOTO BUILDING	F4/76
58	BEQ E6-E9	F3/76
59	DIV/WING HDQ	F3/81
60	BEQ E1-E4	F3/81
62	EM CLUB E1-E4	F4/81
63	LIBRARY	F4/81
65	HOSPITAL	F4/81
66	ADMIN	F4/81
67	BEQ E6-E9	F3/76
80	PRINTING PLANT	F3/76
84	MBX	F4/82
89	BOWLING ALLEY	F3/81
101	CO/BTRY HDQ	F3/75
102	DIV/WING HDQ	F2/75
106	GEN STORAGE	F2/74
107	GEN STORAGE	F3/75
111	CO/BTRY HDQ	F3/74
114	BN SQDRM HDQ	F3/74
115	GYMNASIUM	F3/74
117	ELEC/COM MANT SHOP	F3/74
118	ACAD INSTR BUILDING	F3/73
119	CO/BTRY HDQ	F3/73
122	EM DINING	F3/73
123	REG/GROUP HDQ	F3/72
125	EM CLUB E1-E3	F3/72

HADNOT POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
127	BN SQDRN HDQ	F3/72
201	GYMNASIUM	F5/75
203	BN SQDRN HDQ	F5/75
205	BEQ E1-E4	F5/75
206	GEN STORAGE	F4/75
211	EM DINING FAC	F5/75
213	BEQ E1-E4	F5/74
214	BN SQDRN HDQ	F4/74
216	REG HDQ	F4/74
217	BEQ E1-E4	F5/74
219	BN SQDRN HDQ	F5/74
221	BN SQDRN HDQ	F5/74
223	REG/GROUP HDQ	G1/74
225	ADMIN	F4/75
226	GEN STORAGE	F5/74
233	ADMIN	F5/75
236	CBT TRNG PL/TK	F3/75
300	GYMNASIUM	F5/76
302	ADMIN	G1/76
304	CO/BTRY HDQ	G1/75
307	ELEC MAINT SHOP	G1/76
308	BEQ E1-E4	G1/75
309	BEQ E1-E4	G1/76
312	BEQ E1-E4	G1/75
313	BEQ E1-E4	G1/76
314	BN SQDRN HDQ	G1/74
315	BN SQDRN HDQ	G1/76
316	BEQ E1-E4	G1/74
317	BM SQDRN HDQ	G2/75
318	BEQ E1-E4	G2/74
320	DIV/WING HDQ	G2/74
321	BEQ E1-E4	G2/75
322	PO MESS SNCO	G1/75
323	BEQ E1-E4	G2/75
325	EM DINING FAC	G2/75
326	BEQ E1-E4	G2/75
327	BEQ E1-E4	G2/75
400	BN SQDRN HDQ	G1/81
401	GYMNASIUM	G2/81
403	LOCATION EX	G2/81
407	BEQ E1-E4	G2/81
408	EM DINING FAC	G2/76
411	EM DINING FAC	G3/76
412	BEQ E1-E4	G2/76
416	BM SQDRN HDQ	G2/76
417	BEQ E1-E4	G3/76
419	BN SQDRN HDQ	G3/76
420	BEQ E1-E4	G2/76

HADNOT POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
422	BEQ E1-E4	G3/76
423	REG/GROUP HDQ	G3/76
424	GEN STORAGE	G3/76
425	PO MESS NCO	G1/81
460	DENTAL CLINIC	G3/75
500	GYMNASIUM	G2/82
501	BN SQDRM HDQ	G3/82
502	BEQ E1-E4	G3/82
503	BEQ E1-E4	G3/82
506	BEQ E1-E4	G3/82
507	BEQ E1-E4	G3/82
508	EM DINING FAC	G3/81
509	GEN STORAGE	G3/82
510	BEQ E1-E4	G3/81
511	BEQ E1-E4	G3/82
514	BEQ E1-E4	G3/81
515	BEQ E1-E4	G4/82
516	BN SQDRN HDQ	G3/81
517	BEQ E1-E4	G4/81
518	DIV/WING HDQ	G3/81
519	BEQ E1-E4	G4/81
520	BN SQDRN HDQ	G4/81
521	EM DINING FAC	G4/81
523	BEQ E1-E4	G5/81
524	EM CLUB E1-E3	G3/83
526	BN SQDRN HDQ	G5/81
527	BEQ E1-E4	G5/81
540	CBT TRNG PL/TK	G4/76
751	FIELD HOUSE	G1/82
898	GUEST HOUSE	F3/82
900	FIRST AID & SICK CALL	F2/86
901	FIELD MAINT SHOP	F2/86
902	AUTO MAINT SHOP	F1/86
904	GEN STORAGE	F2/91
905	BN SQDRN HDQ	F3/91
907	GEN STORAGE	F4/86
908	AUTO VEH MAINT SHOP	F3/91
909	GEN STORAGE	F3/86
910	WELDING SHOP	F1/86
914	REG GROUP HDQ	F3/91
915	GEN STORAGE	F4/91
916	GEN STORAGE	F4/91
1002	FILLING STATION	F3/85
1004	FUEL PUMP HSE	F3/85
1005	ADMIN	F3/85
1006	EM CLUB E1-E3	F3/86
1011	GEN WHSE	F4/86
1012	GEN WHSE	F4/86

HADNOT POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
1015	FOOD LOCKERS	F4/86
1041	DISPENSARY	F4/91
1042	BEQ ES	F4/91
1100	PRINTING PLANT	F2/84
1101	GEN WHSE MC	F3/84
1103	HOBBY SHOP	F3/85
1104	PW SHOPS	F3/85
1105	ADMIN	F3/85
1106	HOBBY SHOP	F4/85
1107	HOBBY SHOP	F4/85
1108	BN SQDRN HDQ	F3/84
1111	MC GUARD	F2/84
1114	MOVER STORAGE	F4/85
1115	PHOTO LAB	F2/84
1116	GEN WHSE MC	F4/86
1117	GEN WHSE	F4/86
1118	GEN STG	F5/86
1120	HOBBY SHOP-AUTO	F3/85
1140	BEQ E1-E4	F4/85
1200	COMMISSARY	F3/84
1201	GEN WHSE MC	F3/84
1202	PW SHOPS	F3/84
1207	LOCATION EX	F4/85
1208	ADMIN	F4/85
1209	EM DINING FAC	F4/85
1211	GEN STORAGE	F5/85
1212	GEN STORAGE	F5/86
1220	RESTAURANT	F3/84
1300	COLD STORAGE	F3/84
1301	GEN WHSE MC	F3/84
1302	GEN STORAGE	F4/84
1304	GEN STORAGE	F4/84
1309	GEN WHSE MC	F4/84
1310	AUTO ORG SHOP	F4/84
1316	GEN WHSE MC	F5/85
1317	GEN WHSE	F5/85
1340	BEQ E1-E4	F4/85
1400	FIRE STATION	F3/83
1401	GEN STORAGE	F3/83
1403	ADMIN	F4/84
1407	ADMIN	F4/84
1409	BOAT SHOP	F4/84
1410	GEN WHSE MC	F4/84
1450	AUTO ORTGL SHOP	F5/85
1500	LAUNDRY/DRY CLEANING	F4/83
1502	AUTO VEH MNT SHOP	F4/83
1601	CO/BTRY HDQ	F5/83
1606	SERVOMART	F4/83

HADNOT POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
1607	AUTO SHOP	F5/83
1610	EX SERVICE STATION	F4/83
1611	EX SERVICE STATION	F4/82
1612	EX SERVICE STATION	F4/82
1613	FILLING STATION	F4/82
1706	SHLTR MISC PIPE	F5/85
1707	COMM MAINT SHOP	F5/83
1750	AUTO SHOP	G1/83
1755	AUTO SHOP	G1/84
1770	POST OFFICE	G2/82
1771	COMM MAINT SHOP	G1/84
1775	MOTOR TRANSPORT	G2/84
1780	AUTO SHOP	G2/84
25	DRY CLEANING PL	F3/76
1404	RANGE OPERATION CTR	F4/84
HP51	BEQ E1-E4	F4/81
HP57	BEQ E1-E4	F3/76
HP105	BEQ	F3/75
HP115	BEQ E1-E6	F3/74
HP125	BEQ E1-E6	F3/74
HP127	REG HDQ	F3/72
HP135	BEQ	F3/74
HP140	MECH ROOM	F2/74
HP145	BEQ	F3/74
HP155	BEQ	F3/74
HP165	BEQ	F3/73
HP170	MECH ROOM	F3/73
HP175	BEQ	F3/74
HP185	BEQ	F3/73
HP195	BEQ	F3/73
HP215	BEQ	F4/75
HP255	BEQ	F5/74
HP265	BEQ	F5/74
HP267	MECH ROOM	F5/74
HP275	BEQ	F5/74
HP285	BEQ	F5/74
HP295	BEQ	F5/74
HP301	BEQ E1-E4	G1/76
HP405	BEQ E1-E4	G2/81
HP550	BEQ	G4/81
HP560	BEQ	G4/81
HP1016	EX MAINT SHOP	F4/86
S86	MECH ROOM	F4/81
S96	MECH ROOM	F3/81
S1210	MECH ROOM	F4/85

HOSPITAL POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
H14	BEQ	F2/66
H16	BEQ	F2/66
H17	GEN STORAGE	F1/65
H18	OPR VEH GAR	F165
H19	PW SHOPS	F1/65
H21	LAUNDRY	F1/66
H23	BEQ	F1/65
H24	BEQ	F1/65
H36	MOTOR POOL	F1/65
H39	EX SNACK STD	F1/65
H17N	GENL STORAGE	F1/65
H15A	BATTALION HDQ	F2/65

PARADISE POINT
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
2600	FIRE STATION	C5/63
2602	BOQ W1-02	C5/63
2603	BOQ W1-02	C5/63
2604	BOQ W1-02	C5/63
2605	BOQ W1-02	C5/62
2607	BOQ W1-02	D1/62
2609	BOQ W1-02	D1/63
2611	BOQ W1-02	D1/63
2613	BOQ W1-02	D1/63
2615	COM OFF MESS	C5/63
2617	BOQ W1-02	C5/63
2624	CHILD CARE CENTER	C4/63
2625	CHILD CARE CENTER	C5/63
2626	REC PAVILION	C5/63
2627	SCOUT PAVILION	C5/63
2628	COM OFF MESS	C5/64
2629	GEN WHSE MKC	C5/63

RIFLE RANGE
BUILDING LIST

BUILDING NO.	BUILDING USE	MAP LOC
RR1	BEQ E1-E4	M2/26
RR2	BEQ E1-E4	M2/26
RR3	EM DINING FAC	M2/26
RR4	BEQ E1-E4	M3/26
RR5	BEQ E1-E4	M3/26
RR8	GYMNASIUM	M3/26
RR9	BOQ W1-02	M2/26
RR10	LOCATION EXCHANGE	M2/26
RR11	ADMIN	M2/26
RR12	ADMIN	M3/26

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Model 1R, 2R and 2R-SL specifications

POWER

Models 1R and 2R are designed for water operation. Model 2R-SL is steam operated. Pumps work efficiently with water or steam pressures ranging from 10 to 150 psi.

FLOAT ASSEMBLY

Made entirely of copper, the float slides on the center tube to automatically actuate a low-friction, leakless valve. The link action of the float arm effects positive instantaneous control of the water or steam pressure.

STRAINER

A large brass strainer provides a substantial base with four legs to hold the pump above accumulation of dirt in the sump.

PUMP

The pump is a bronze ejector type and has no moving parts. This provides exceptionally long life expectancy.

TUBE

The tube is brass construction and provides a guide for the float.

CONSTRUCTION

With the exception of the float, which is copper, all parts are made of bronze or brass to eliminate rust and corrosion problems.

Shipping weights

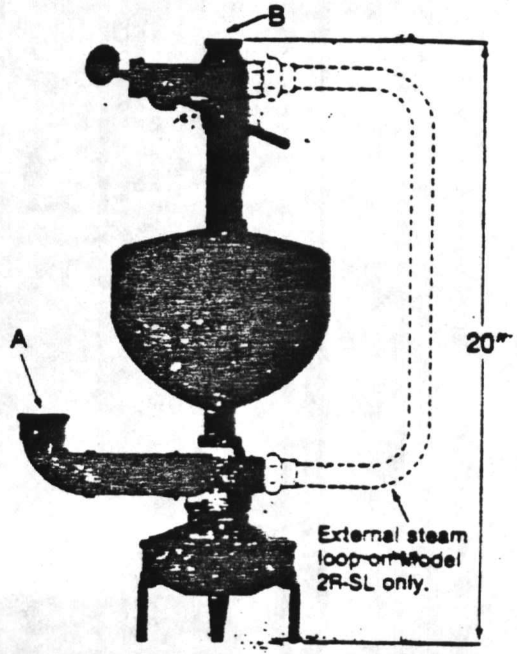
- Model 1R: 13 lbs.
- Model 2R: 14 lbs.
- Model 2R-SL: 15 lbs.

For more information, see your Penberthy distributor:

PENBERTHY HOUDAILLE

Penberthy Division, Houdaille Industries, Inc.
P.O. Box 112, Prophetstown, Illinois 61277
Telephone: 815/537-2311 Telex 25 7308

DIMENSIONS



	Pipe Connect. (Outlet) "A"	Pipe Connect. (Inlet) "B"	High Water	Drainer Diam.
1R	1"	½"	13½"	10⅜"
2R	1¼"	¾"	13½"	12⅞"
2R-SL	1¼"	¾"	13½"	14¾"

CAPACITIES

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Model R Water Operated Cellar Drainer

and

Model 2R-SL Steam Operated Sump Pump

INSTALLATION INSTRUCTIONS

(1) Sump should be at least 16" diameter.

(2) Pump must be placed on hard level surface. Use bricks or other suitable support in bottom of open tile sumps, never place drainer directly on clay or earth surface.

(3) Choose a location which will allow discharge piping to be routed with the least elevation, the least number of turns, and the least total length of pipe.

(4) Do not use pipe size smaller than the pump connections.

(5) Inlet piping should be equipped with the special strainer union supplied with your pump. This strainer will protect the valve and nozzle from pipe scale and dirt.

(6) Install a swing type check valve in discharge line to prevent backflow when pump stops. (1" size for Model 1R, 1¼" size for Models 2R and 2R-SL).

(7) Flush out inlet line before making final connections to pump.

(8) These pumps are factory set to operate at 10 to 60 PSI motive pressure (water for Models 1R & 2R, steam for Model 2R-SI) for higher pressures — up to 150 PSI, hanger should be set at corresponding number on valve lever arm.

(9) Open inlet supply valve and leave it open.

(10) To check installation, gradually fill sump with water. Pump valve will open when water level reaches about ¾" below float rim. Drainer will pump water until level drops sufficiently for float to pull valve shut.

OPERATING INSTRUCTIONS

(1) Check operation of pump a few times each year by adding water to sump, especially before normal heavy operating period.

(2) Remove debris from sump periodically.

(3) Clean suction screen if it appears to be covered with lint or other material.

(4) Clean inlet union strainer periodically.

(5) Do not allow pump to handle cement, mortar, plaster, gravel or mud.

SERVICE INSTRUCTIONS

IF PUMP FAILS TO OPERATE:

(1) Check to be sure float is free to move up and down.

(2) Check for leaky or damaged float.

(3) Check for clogged inlet line or jets.

IF PUMP FAILS TO EMPTY SUMP:

(1) Check for sticking check valve or restriction in outlet flow.

(2) Check for excessive inflow into sump.

(3) Check to be sure you have sufficient water or steam pressure available. (IMPORTANT: Total elevation from bottom of sump to top of discharge line not to exceed 1 foot for each 4 PSI of motive pressure.)

(4) Check for clogged strainer.

IF VALVE WILL NOT SHUT OFF:

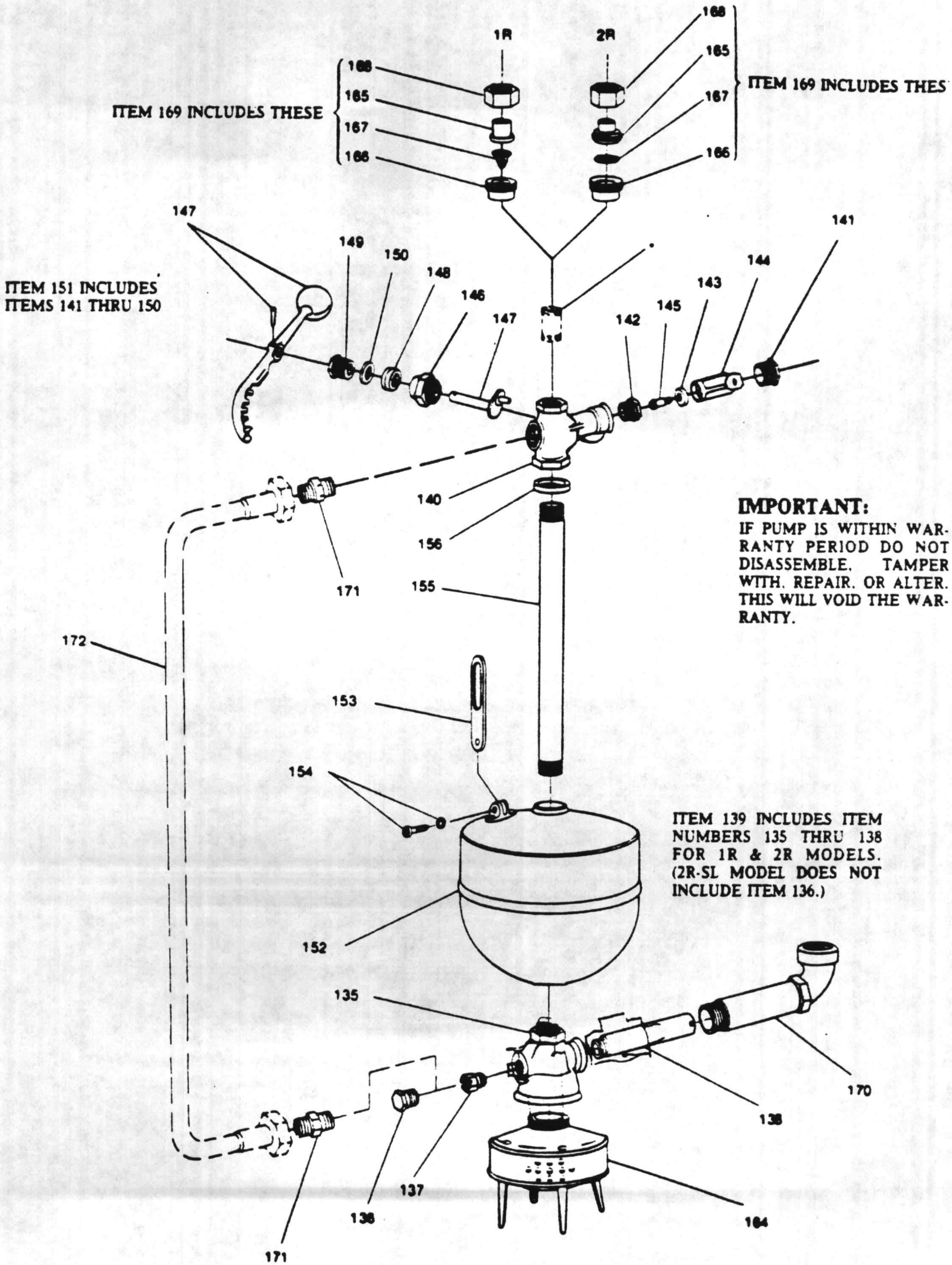
(1) Check to be sure float is free to move.

(2) If valve is sticking, disassemble and clean out, or loosen packing gland until valve works freely.

PENBERTHY

#11642-009 P.O. Box 112 Prophetstown, Illinois 61277

EXPLODED VIEW



IMPORTANT:
IF PUMP IS WITHIN WARRANTY PERIOD DO NOT DISASSEMBLE, TAMPER WITH, REPAIR, OR ALTER. THIS WILL VOID THE WARRANTY.

ITEM 139 INCLUDES ITEM NUMBERS 135 THRU 138 FOR 1R & 2R MODELS. (2R-SL MODEL DOES NOT INCLUDE ITEM 136.)

*SUPPLIED BY CUSTOMER

DISASSEMBLY - REASSEMBLY INSTRUCTIONS

DISASSEMBLY

STRAINER UNION ASSEMBLY

(1) Disconnect cellar drainer at inlet and outlet unions.

(2) Remove cellar drainer from sump.

(3) Remove inlet strainer union assembly (item 169) which includes coupling nut (item 168), union male seat (item 165), union strainer screen (item 167), and union female seat (item 166).

(4) Remove any inlet and outlet pipes.

STEAM LOOP

(1) On 2R-SL Model, loosen coupling nuts of tube assembly (item 172) and remove tube assembly.

(2) Remove both adaptors (item 171).

WATER AND DELIVERY JETS

(1) On 1R and 2R Models remove plug (item 136) and water jet (item 137) from ejector body (item 135).

(2) On 2R-SL Models remove steam jet (item 137) from ejector body (item 135).

(3) Remove discharge elbow (item 170) and delivery jet (item 138) from ejector body.

STRAINER

(1) Remove strainer assembly (item 164) from ejector body.

(2) Strainer parts are riveted together; if disassembly is required, drill out rivets and use brass screws to reassemble.

FLOAT

(1) Hanger (item 153) may be removed from float (item 152) by unfastening hanger screw and lock washer (item 154).

(2) Loosen float guide tube (item 155) from valve body (item 140) and remove the tube washer (item 156).

(3) Slide float (item 152) off of tube (item 155).

(4) Loosen tube from ejector body (item 135).

(5) Remove hanger (item 153) from valve lever (item 147).

VALVE

(1) Remove valve body plug (item 141) for 1R and 2R Models and adapter (item 171) for 2R-SL Model from valve body.

(2) Loosen and remove valve bonnet (item 146).

(3) Valve disc holder (item 144) may be removed at this time. Valve disc (item 143) and screw (item 145) may be taken off at this time.

(4) To disassemble valve packing remove pin (item 147) from lever (item 147) and slide lever off stem. Loosen valve packing gland (item 149) from valve bonnet, and remove. Valve packing (item 148) and gland washer (item 150) may be pulled out from valve bonnet.

(5) Valve seat (item 142) may now be unscrewed from valve body.

REASSEMBLY

WATER AND DELIVERY JETS

(1) Fasten ejector body to strainer assembly.

(2) Replace delivery jet and discharge elbow onto ejector body.

(3) Water jet and plug may be replaced on 1R and 2R Models to the ejector body.

(4) Fasten steam jet onto ejector body on 2R-Sl Model.

(5) Replace the adaptor onto ejector body.

FLOAT

(1) Tighten tube to ejector body, and slide float onto tube.

(2) Connect hanger to float by tightening hanger screw and lock washer.

VALVE

(1) Replace valve body and tube washer to tube.

(2) Replace valve body seat.

(3) Reassemble valve disc onto holder using screw. Then insert holder in valve body. Take valve stem and valve bonnet, and replace into valve body making certain that peg on stem slides into holder. Tighten valve bonnet.

(4) Slide two valve packings, and one packing washer on stem; then replace packing gland. Tighten moderately.

(5) Slide lever on stem and replace pin.

(6) Slide float hanger on lever.

STEAM LOOP

(1) On 2R-Sl Models attach steam loop tube assembly to valve body and ejector body.

STRAINER UNION ASSEMBLY

(1) Replace any inlet and outlet pipes.

(2) Replace inlet strainer union assembly, including coupling nut, union male seat, union strainer screen, and union female seat.

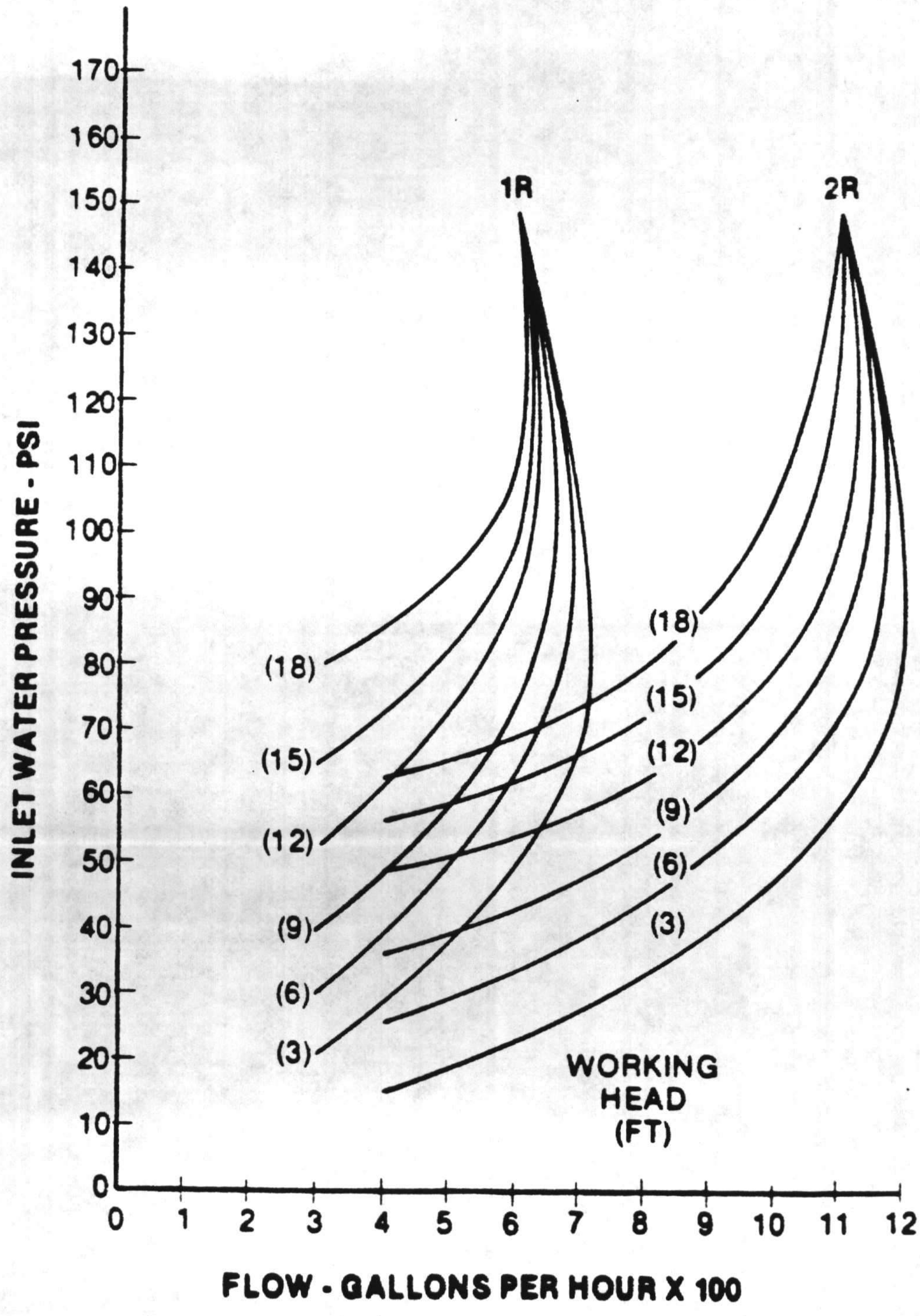
(3) Attach cellar drainer to inlet and outlet unions.

PARTS & MATERIALS LIST

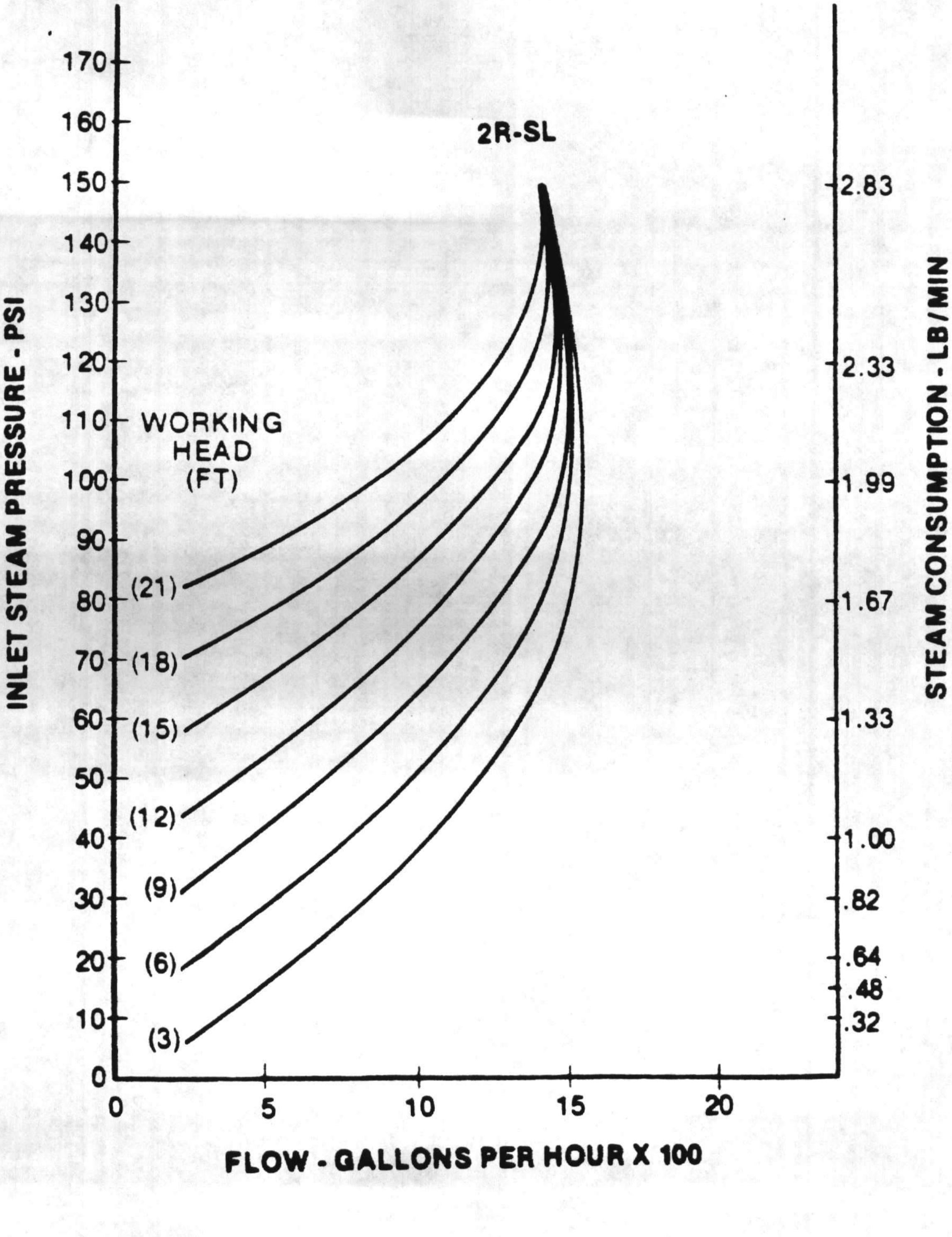
Key No.	Part Description	1R		2R		2R-SL	
		Part No.	Material	Part No.	Material	Part No.	Material
135	Ejector Body	40928-002	Bronze	40928-002	Bronze	40928-002	Bronze
136	Ejector Body Plug	40614-002	Brass	40614-002	Brass		
137	Water Jet	40927-002	Brass	40616-002	Brass		
137	Steam Jet					42312-002	S.S.
138	Delivery Jet	40617-002	Brass	40618-002	Brass	42313-002	S.S
139	Ejector Assembly	40615-001		40616-001		42310-001	
140	Valve Body (Includes Seat)	40633-002	Bonze	40636-002	Bronze	42314-002	Bronze
141	Valve Body Plug	40614-002	Brass	40614-002	Brass	40614-002	Brass
142	Valve Body Seat	40640-002	Brass	40640-002	Brass	40640-002	Brass
143	Valve Disc	12691-010	Rubber	12691-010	Rubber	12691-020	Teflon
144	Valve Disc Holder	40639-002	Bronze	40639-002	Bronze	40639-002	Bronze
145	Valve Disc Screw	40638-002	Brass	40638-002	Brass	40638-002	Brass
146	Valve Bonnet	40603-002	Brass	40603-002	Brass	40603-002	Brass
147	Valve Stem, Lever & Pin	40607-001	Bronze & Brass	40607-001	Bronze & Brass	42335-001	Bronze & B[illegible]
148	Valve Packing (2 Required)	40606-002	Graphite Asbestos	40606-002	Graphite Asbestos	40606-002	Graphite Asbestos
149	Valve Packing Gland	40604-002	Brass	40604-002	Brass	40604-002	Brass
150	Valve Packing Gland Washer	40605-002	Brass	40605-002	Brass	40605-002	Brass
151	Valve Assembly	40921-001		40922-001		42314-001	
152	Float	40611-001	Copper	40611-001	Copper	40611-001	Copper
153	Hanger	40608-002	Brass	40608-002	Brass	42336-002	Brass
154	Hanger Screw & Lock Washer	40609-001		40609-001		40609-001	
155	Float Guide Tube	40613-002	Brass	40613-002	Brass	42310-002	Brass
156	Guide Tube Washer	40601-002	Rubber	40601-002	Rubber	40601-002	Rubber
164	Strainer Assembly	40598-001	Brass	40598-001	Brass	40598-001	Brass
165	Strainer Union — Male Seat	40642-002	Brass	40622-002	Bronze	40622-002	Bronze
166	Strainer Union— Female Seat	42337-002	Bronze	40623-002	Bronze	40623-002	Bronze
167	Strainer Union Screen	40643-002	Monel	40625-002	Brass	40625-002	Brass
168	Strainer Union— Coupling Nut	51180-002	Brass	40624-002	Bronze	40624-002	Bronze
169	Strainer Union Assembly	40642-001		40622-001		40622-001	
170	Discharge Elbow	40619-002	Bronze	40620-002	Bronze	40620-002	Bronze
171	Adaptor					42311-002	Brass
172	Tube Assembly					42315-001	Brass

PERFORMANCE

MODEL 1R & 2R



MODEL 2R-SL


2R-SL
INLET STEAM PRESSURE - PSI
STEAM CONSUMPTION - LB/MIN
WORKING
HEAD
(FT)
(21)
(18)
(15)
(12)
(9)
(6)
(3)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
2.83
2.33
1.99
1.67
1.33
1.00
.82
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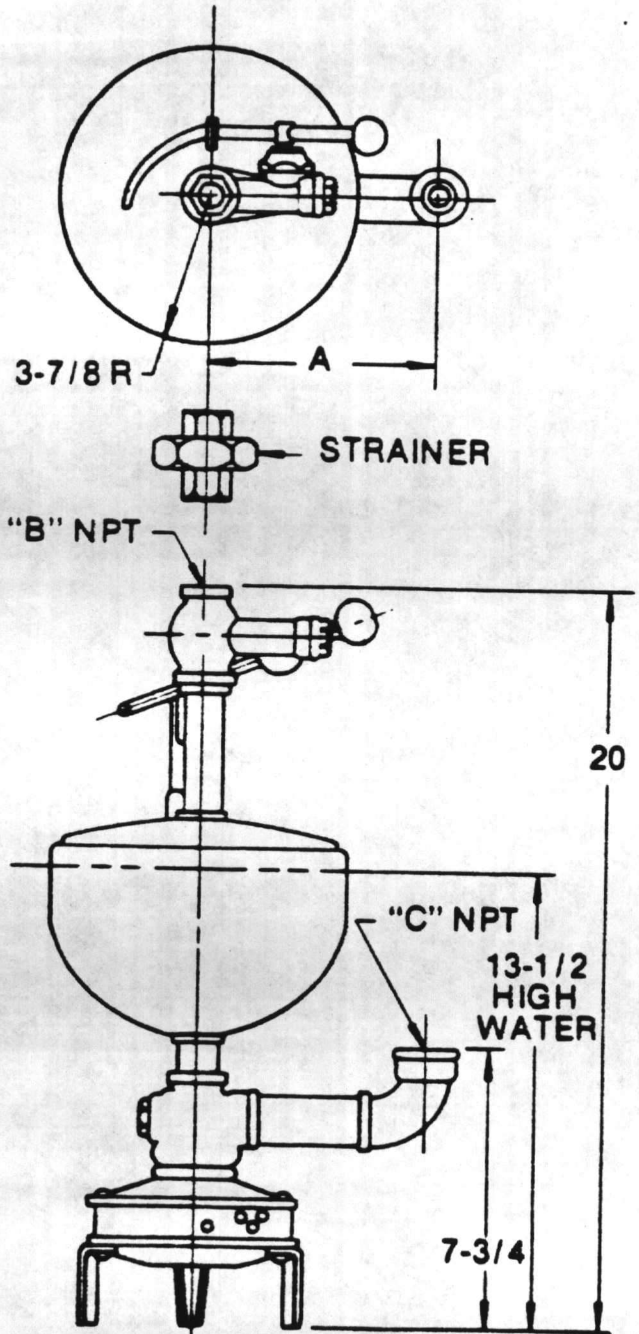
FLOW - GALLONS PER HOUR X 100

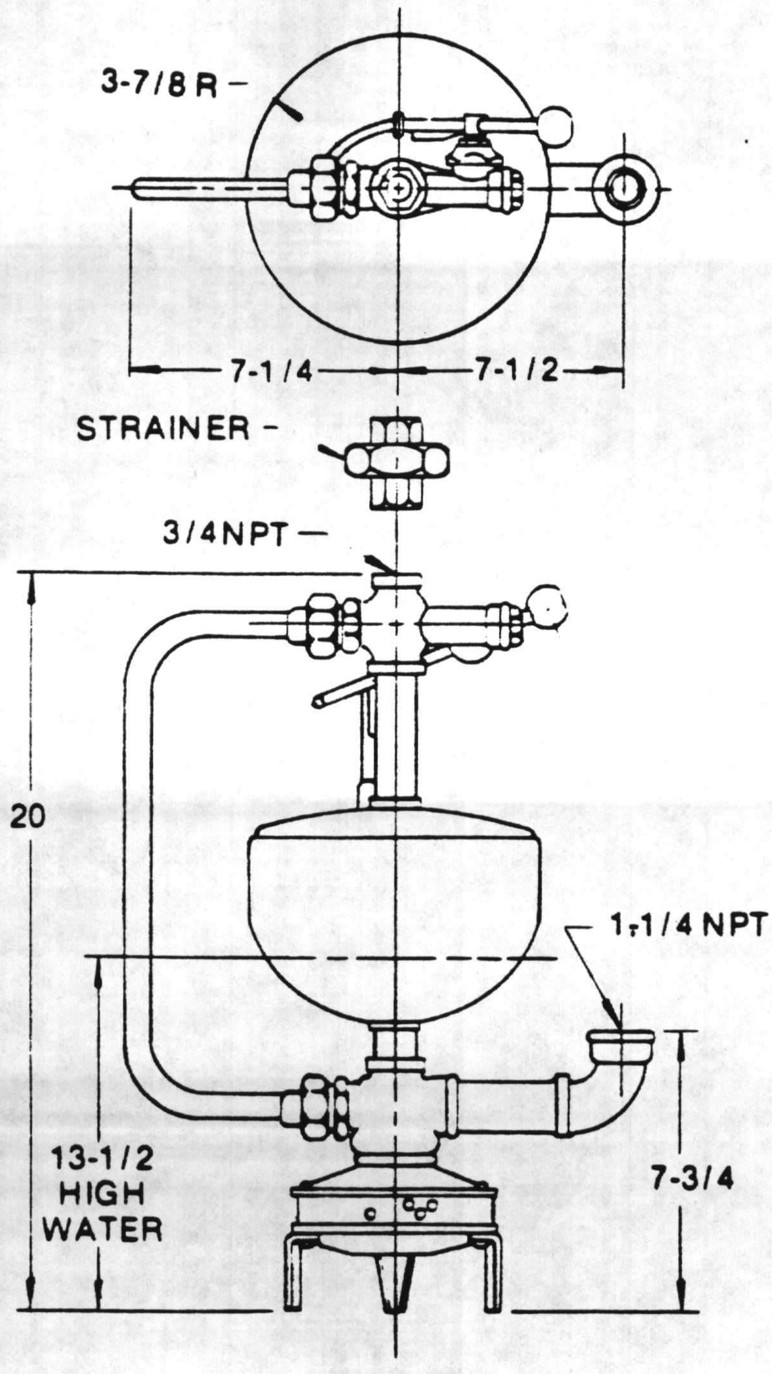
DIMENSIONS

MODEL 1R & 2R



MODEL	A	B	C
1R	6	1/2	1

MODEL 2R-SL

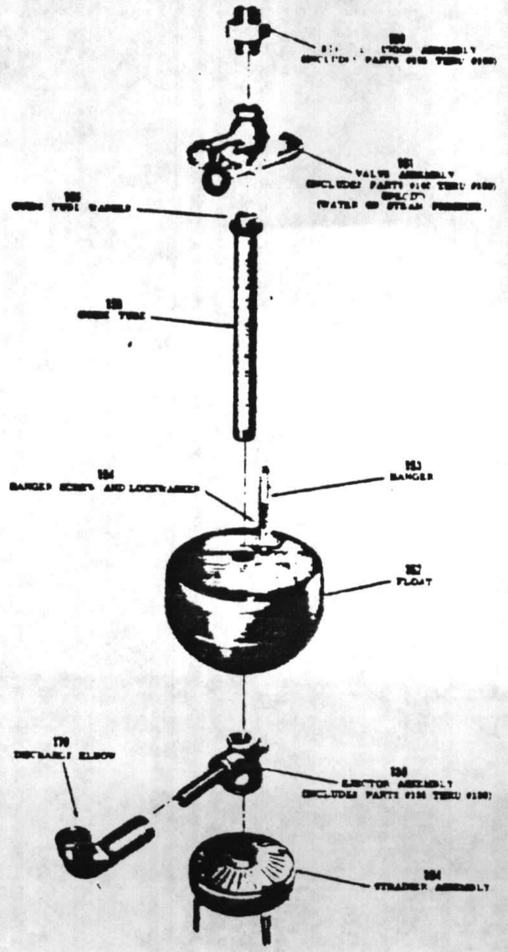


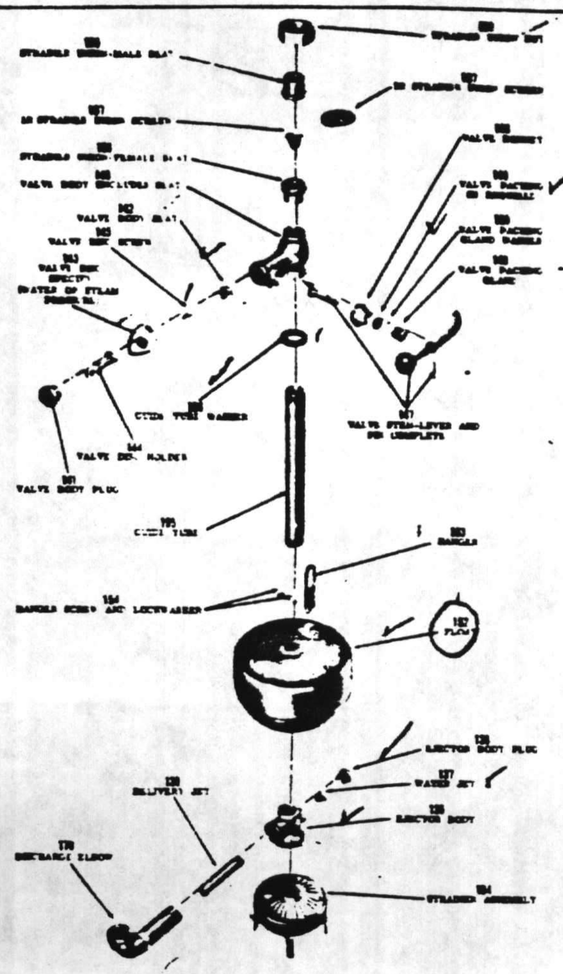
MODEL	A	B	C
2R	7-1/2	3/4	1-1/4

Prophetstown, Illinois

2660 E. Grand Blvd.
Detroit 11, Michigan

MODEL "R" AUTOMATIC CELLAR DRAINERS PARTS FOR REPAIRS





1 JUL 85 PRICES

Cat. No.	Part Name	List Price 1R	List Price 2R
135	Ejector Body	8.25	8.25
19.36 — 136	Ejector Body Plug	.85	.85
32 — 137	Water Jet	.55	.85
138	Delivery Jet	1.95	2.20
140	Valve Body (Includes Seat)	6.35	7.15
141	Valve Body Plug	.85	.85
142	Valve Body Seat	.85	.85
143	Valve Disc - Note: Specify Water or Steam Operated	.25	.25
144	Valve Disc Holder	2.20	2.20
— 145	Valve Disc Screw	.35	.35
67.75 — 147	Valve Stem-Lever and Pin	5.50	5.50
146	Valve Bonnet	1.95	1.95
148	Valve Packing (2 Required)	.25	.25
149	Valve Packing Gland	.55	.55
150	Valve Packing Gland Washer	.05	.05

Cat. No.	Part Name	List Price 1R	List Price 2R
139	Ejector Assembly (Includes Parts #135 thru #138)	11.50	12.00
151	Valve Assembly (Includes Parts #140 thru #150) Note: Specify Water or Steam Operated	20.00	23.50

Cat. No.	Part Name	1R	2R
152	Float	12.90	12.90
153	Hanger	.45	.45
6.10 — 154	Hanger Screw and Lockwasher	.10	.10
46.70 — 155	Guide Tube	5.50	5.50
156	Guide Tube Washer	.20	.20
164	Strainer Assembly	10.00	10.00

Cat. No.	Part Name	1R	2R
165	Strainer Union-Male Seat	1.95	2.75
166	Strainer Union-Female Seat	1.95	2.75
167	Strainer Union Screen	.30	.55
168	Strainer Union Nut	2.00	2.75
169	Strainer Union Assembly (Includes Parts #165 thru #168)	5.80	8.80

Cat. No.	Part Name	1R	2R
24.75 — 170	Discharge Elbow	6.35	10.00

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PENBERTHY HOUDAILLE

Section	100(
Application Report	177:
Issued	11/:
Replaces	NEW

application report

FOR: AUTOMATIC SUMP DRAINER - GOVERNMENT UNIT

006/408/02.

The U.S. Government has been purchasing the 2R Cellar Drainers which are listed as:

National Stock Number: 4320-00-510-8037 $601.56

Description: Sump, pump

The new Penberthy Houdaille Automatic Sump Drainer has been approved as the replacement for the 2R units and listed under the same National Stock Number.

To satisfy the Government's need to replace a single unit with a like single unit, Penberthy Houdaille part number 59637-000 has been assigned to combine the necessary Automatic Sump Drainer components that equates to the Model 2R Cellar Drainer. The components included in this part number are:

LL 1 Jet	Bronze
Pilot Valve 1"	Bronze
Float Rod	Stainless Steel
Float Rod Sub-assembly 1"	Stainless Steel
Stand Pipe Sub-assembly 1"	Steel
Foot Valve 1"	Bronze
Bushing 1" x 1/2" Hex	Steel

Part number 59637-000 is currently in the Government's system under the National Stock Number shown above.

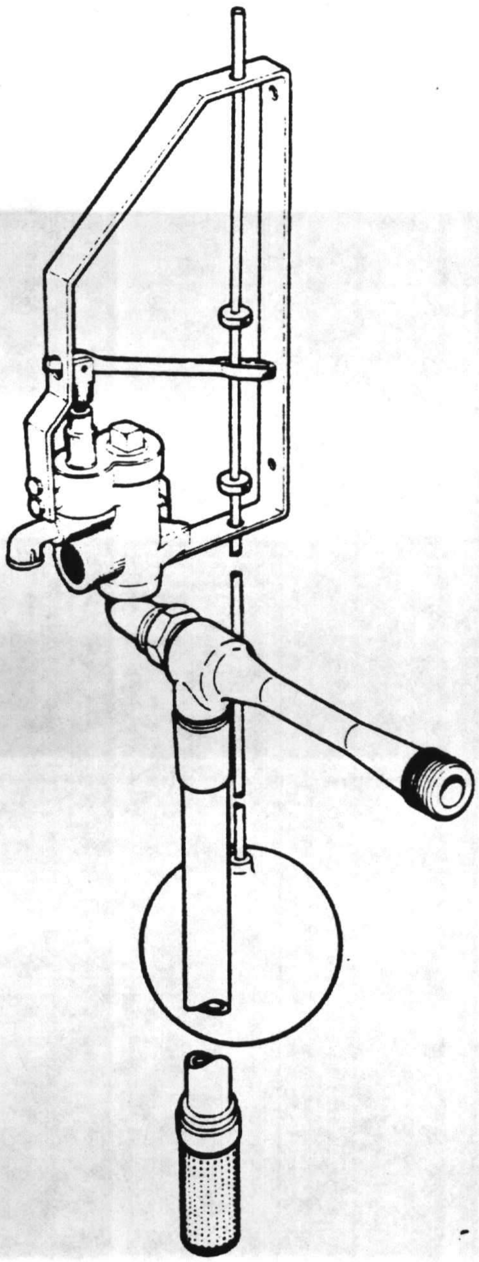
A new Penberthy Houdaille part number will be established for a steam operated unit when the request is made by the Government.

Automatic Sump Drainers are used on Air Force, Marine and Navy military bases as back up pumps, or for use in remote locations. These bases order these units through the Defense Construction Supply Center (DCSC) and also often buy them from local supply houses.

PENBERTHY HOUDAILLE ®

Section	1000
Instal Instr	1958
Issued	6/82
Replaces	NEW

Automatic Sump Drainer



Installation / Operation / Maintenance Instructions

PENBERTHY HOUDAILLE

INSTALLATION / OPERATION / MAINTENANCE FOR AUTOMATIC SUMP DRAINER

This manual has been prepared as an aid and guide for personnel involved in installation or maintenance. All instructions must be read and understood thoroughly before attempting any installation, operation, or maintenance. Failure to follow *any* instruction could possibly result in a malfunction of the automatic sump drainer resulting in leakage of the contained fluid, property damage, or physical injury to personnel.

Caution: Penberthy Houdaille does not have any control over the manner in which its automatic sump drainer is handled, installed, or used, and Penberthy Houdaille cannot and does not warrant or guarantee that an automatic sump drainer is suitable or compatible with the user's specific application.

WARNING: **Safety glasses should be worn when installing or operating an automatic sump drainer.**

I. INTRODUCTION:

A. Features and Specifications

Penberthy Houdaille automatic sump drainers consist of a pilot operated valve, jet pump, stand pipe, foot valve, float rod and float. They are designed to remove liquids from sumps when the liquid reaches a predetermined level. They will then pump the liquid against a maximum discharge pressure until the sump liquid level lowers to a predetermined level.

B. Design Ratings PSIG at Maximum and Minimum Operating Temperatures

The pilot operated valve maximum allowable operating pressure is 200 PSIG at -20°F to +400°F.

The jet pump maximum allowable operating pressures are listed below:

MATERIAL	BODIES	NOZZLES
Bronze	200 PSIG at -20°F to +150°F 125 PSIG at +400°F	200 PSIG at -20°F to +400°F
316 STS	200 PSIG at -150°F to +150°F 125 PSIG at +400°F	200 PSIG at -150°F to +400°F

To determine the maximum allowable working pressure at a specific temperature for the specific jet pump, the user should refer to Penberthy Houdaille dimension sheets, or when provided, the specifically stated design limits on a Penberthy Houdaille product proposal.

The foot valve maximum allowable working pressure is 150 PSIG at -20°F to +180°F.

Caution: On installations requiring operating pressures above 150 PSIG, a pressure relief valve must be installed in the jet pump discharge line to keep from over-pressuring the foot valve and the jet pump in the event of discharge line plugging or blockage.

C. Application Data

Maximum sump liquid temperature is +180°F when operating with liquid and +150°F when operating with steam, at a 5 ft. suction lift. Minimum operating pressure is 40 PSIG.

Jet pump application range; size 1" valve will handle models LL, LM, GL, and GH in sizes 3/4", 1", 1-1/4", and 1-1/2". Size 2" valve will handle models LL, LM, GL, and GH in sizes 2" and 2-1/2".

Note: For specific application data within the above ranges, the user should consult the Penberthy Houdaille product proposal for the specific model and size of automatic sump drainer, or should request Penberthy Houdaille to supply the applicable technical data bulletin.

WARNING: **Under no circumstances should these design ratings or application data be exceeded. Exceeding design ratings or application data may cause property damage or physical injury to personnel.**

II. INSPECTION AND PERFORMANCE CONFIRMATION:

A. Receiving Inspection

Upon receipt of automatic sump drainer, check all components carefully for damage incurred in shipping. If damage is evident or suspected, do not attempt installation. Notify carrier immediately and request damage inspection.

B. User's Rating Inspection

The user should confirm:

1. That the pilot operated valve size and pressure/temperature rating, stamped on nameplate (163) conforms to the description on the user's purchase order.
2. That the jet pump size, cast on side of body, model designation, stamped on nozzle hex flats, and pressure/temperature rating, printed within jet pump installation instructions, conforms to the description on the user's purchase order.
3. That the operating conditions described in the purchase order agree with the actual operating conditions at the installation site.
4. That the actual operating conditions at the installation site are within the application data shown on the Penberthy Houdaille Technical Data Bulletin or product proposal referred to above.
5. That the materials of construction of the automatic sump drainer are compatible with both the contained fluid and surrounding atmosphere in the specific application.

Caution: If the size, model or performance data of the automatic sump drainer as received does not conform with any of the criteria above, do not proceed with installation. Contact an authorized Penberthy Houdaille distributor for direction on what to do.

III. INSTALLATION:

Installation should only be undertaken by qualified experienced personnel who are familiar with this equipment and have read and understood all the instructions in this manual.

The user should refer to Penberthy Houdaille dimension sheets or Penberthy Houdaille product proposal to obtain dimensional information for the specific size and model automatic sump drainer.

A. Planning Considerations

1. Become thoroughly familiar with the installation instruction manual furnished with the jet pump.
2. Penberthy Houdaille automatic sump drainers must be installed in a vertical position with the pilot lever at the top.
3. The sump drainer assembly must be supported by the inlet and discharge piping, or by the float road bracket. There are two 5/16" dia. holes spaced 12-1/2" apart on the vertical leg of the bracket provided for this purpose. If the user elects to support the assembly by the bracket, then the inlet and discharge piping must be separately supported as the bracket is not designed to carry piping loads.
4. Locate the assembly so the foot valve *does not* rest on the bottom of the sump, and the float *does not* touch the sump walls.
5. Locate pilot operated valve so it is accessible for servicing, and float actuation adjustments.
6. The motive fluid line should be equipped by the user with a strainer and a shut-off valve to keep debris from entering the valve and jet pump and to permit servicing.
7. Use Teflon* tape, or equivalent, on all male tapered pipe thread connections.
8. Make provision for safe disposal of 3/8" side connection pilot bleed flow. A small amount of motive fluid will be discharged by the pilot operated valve shortly before and while the valve is open. When operating with a liquid, this flow may be directed to the sump. When operating with steam, it is advisable to vent this flow to atmosphere. In either case, a 1/4 inch pipe or 1/4" I.D. copper line is recommended. See Mounting, Section III, paragraph B.

B. Mounting

1. Install and pipe to pilot operated valve according to the method chosen in Section III, paragraph A3 above.
2. Install the jet pump to the pilot operated valve using reducing bushing when required, which is included within the foot valve carton.
3. Install and support the jet pump discharge line as needed, making sure that the intallation instructions furnished with the jet pump are followed.
4. Thread the foot valve to the stand pipe, and the stand pipe to the jet pump suction and tighten.
5. Install the bleed line according to the method chosen in Section III, paragraph A8 above. When discharging the bleed liquid into the sump, the bleed line can be attached to the stand pipe with hose clamps.

WARNING: Bleed steam must be vented to atmosphere in a safe place.

Do not bleed motive steam to sump liquid because bleed steam may cause splashing of sump liquid, vibration, and may also heat the liquid to a point where the jet pump will cavitate and stop pumping.

Do not turn on motive fluid pressure to pilot operated valve until pilot bleed piping has been completed. Failure to provide piping for pilot bleed will cause motive fluid to discharge from bleed elbow at motive pressure possibly resulting in property damage or injury to personnel.

6. Slip the float rod threaded end first, thru the top bracket hole. Install one collar above and below the lever as the float rod passes thru the lever hole. Push float rod thru the bottom bracket hole; and attach float ball to the threaded end. Tighten top collar in place temporarily so float rods holds the lever down.

IV. OPERATION:

A. Pre-Optional Check

1. Assure that all installation procedures have been completed.
2. Check to determine that all connections are pressure tight.
3. Take all precautions necessary to handle the possibility of leakage.

B. Operating

1. While holding the lever in the up (open) position, slowly open the fluid valve to allow the unit to begin pumping, then open valve fully.
2. Move the lever down and hold in place to cause the valve to close. **Note:** It may take up to 30 seconds for the closing cycle to be completed.
3. Adjust the collars on the float rod at the desired turn-on and turn-off points. See Fig. 1. Note that a) maximum rod travel is 8 inches; b) for minimum travel, collars must be no closer than 1 inch apart or the lever will bind; c) it takes up to 30 seconds for the valve closing cycle to be completed, during which time the jet pump continues to empty the sump; d) turn-off liquid level must be above the suction strainer or the jet will break suction before the cycle is complete and never turn off.

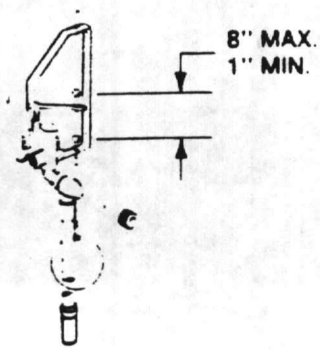


Figure 1

V. MAINTENANCE

Maintenance should only be undertaken by qualified experienced personnel who are familiar with this equipment and have read and understood all the instructions in this manual.

Caution: Do not proceed with any maintenance unless the automatic sump drainer has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids.

A. Preventative Maintenance

The user must create maintenance schedules, safety manuals and inspection details for each specific installation of an automatic sump drainer.

On all installations the following items should be regularly evaluated by the user for purposes of maintenance.

1. Motive fluid line strainer for corrosion and debris build-up.
2. All connections for tightness.
3. External moving parts for clearance wear and lubrication.
4. Turn-on and turn-off levels for correct setting.

The user must determine upon evaluation of his or her own operating experience an appropriate maintenance schedule necessary for his or her specific application. Realistic maintenance schedules can only be determined with full knowledge of the services and application situation involved.

B. Maintenance Procedures

1. Leakage around the pilot stem is an indication of an inadequate seal. Obtain a replacement seal and proceed to replace it as described within the disassembly-reassembly procedures. Section V, paragraph D.
2. Leakage around the pilot seat is an indication of a worn out seat. Obtain a replacement seat and proceed to replace it as described within the disassembly-reassembly procedures. Section V, paragraph D.
3. Should leakage occur through the valve piston seat, disassemble according to instruction in Section V, paragraph D. Lap piston seat into body seat using valve lapping compound. Clean out thoroughly before reassembling.
4. Should the piston stick open, or closed, it is likely that debris is jamming within the tight clearances around the piston. Disassemble, clean, and reassemble according to procedures.
5. In case of jet pump problems, follow the instructions within the jet pump installation manual for the specific model jet pump.

C. Troubleshooting

Problem

Valve will not shut off.

Cause	Cure
Piston sticks.	Clean out piston.
Lever sticks.	Lubricate and remove binds.
Improper collar setting.	Reset according to instructions. Section IV, paragraph B.
Excessive stem leaks.	Replace stem seat.
Sump fills faster than jet can pump.	Reduce flow or resize drainer.
Jet stops pumping.	Remove restrictions in jet discharge line.
Liquid level lowers to foot valve, breaking suction.	Reset according to instructions. Section IV, paragraph B.

Problem

Valve will not turn on.

Cause	Cure
Piston sticks.	Clean out piston.
Lever sticks.	Lubricate and remove binds.
Improper collar setting.	Reset according to instructions. Section IV, Paragraph B

D. Removal — Disassembly — Reassembly

Caution: Do not proceed with the removal of automatic sump drainer from connecting piping unless the automatic sump drainer has been relieved of all pressure or vacuum, has been allowed to reach ambient temperature, and has been drained or purged of all fluids.

WARNING: **When servicing the valve, it is desirable to clamp the lower part of the body in a vise. Do not clamp above the inlet connection or permanent damage to the piston cylinder may result.**

1. To service the pilot stem.
   a) Mark locations of collars on float rod, loosen and remove collars and float rod.
   b) Remove the two hex head bracket screws near the pilot bleed and pry bracket away from valve just enough to pull lever out of the pivot hole.
   c) Loosen and remove gland/pilot stem assembly.
   d) Turn stem counterclockwise to unscrew from fork. Set spring and washer aside with fork/lever assembly.
   e) Pull stem out of gland exposing the seal inside gland.
   f) Pull seal out of gland with needle nose pliers being careful not to scratch the inside surface of the gland.
   g) Remove Teflon seat by catching the I.D. with the first few threads of a 3/8 bolt, and pull out.
   h) Begin reassembly by pressing the new seat in place using a spherical nose tool about 11/16 dia.
   I) Install new seal on stem *open end first. Do not* scrape inside diameter of seal on stem threads or permanent damage to the seal will result. (Preferably avoid any contact of threads and seal.)
   j) Press the stem/seal assembly into gland until the seal bottoms out. Once the three components are in place, *do not* disassemble, or permanent damage to seal will result.

k) Replace washer and spring on threaded end of stem and thread into fork until it bottoms out hand tight.

l) Using Teflon® tape on gland threads, replace gland in pilot operated valve body and wrench tighten.

m) Relocate lever in bracket hole and reattach bracket to pilot operated valve body with hex head screws.

n) Replace collars and lever on float rod.

p) Check operation through several cycles and adjust settings if necessary.

2. To service the piston.

a) Unscrew plug on top of pilot operated valve and remove.

b) Remove spring and piston.

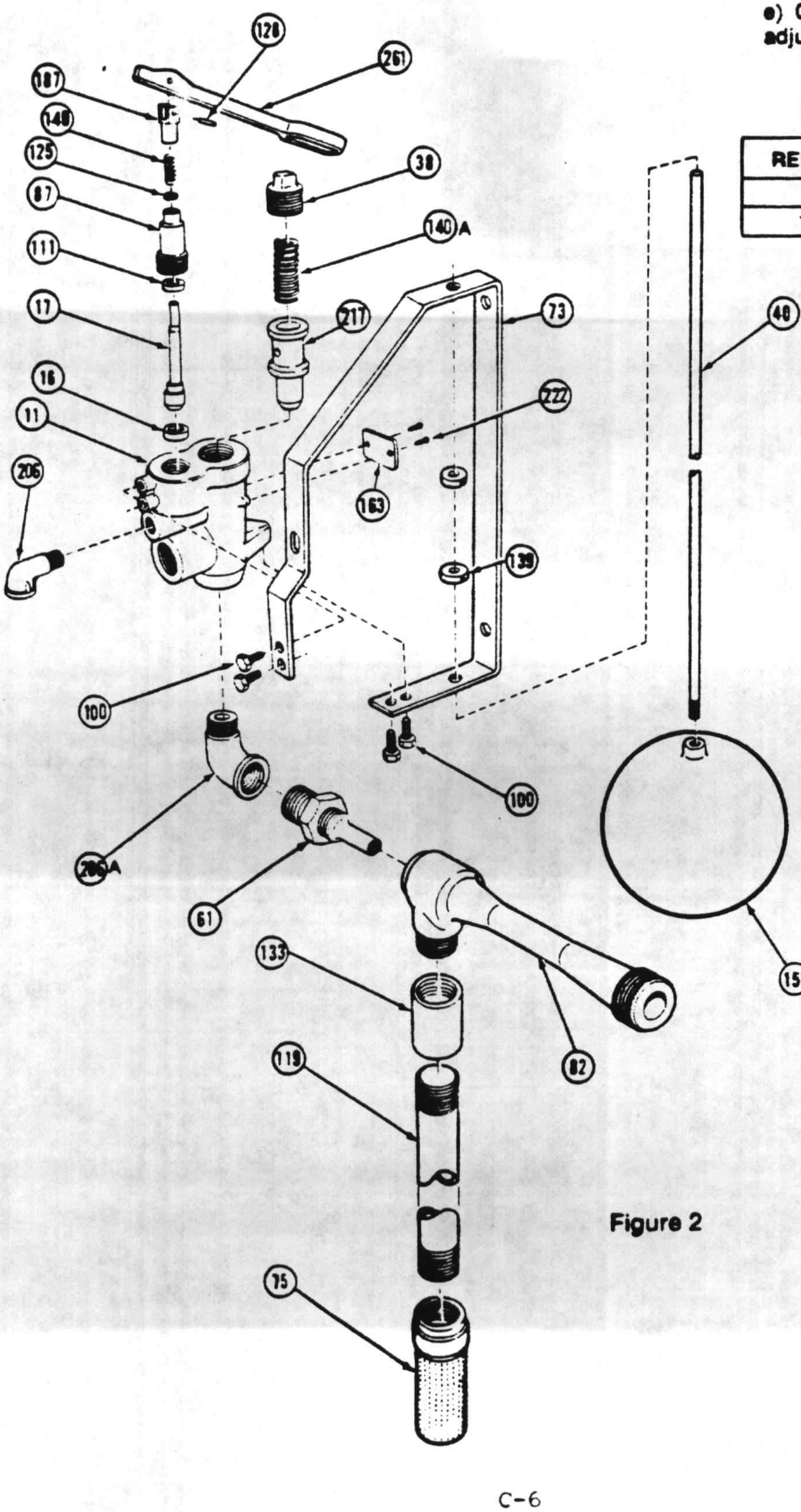
c) After lapping and clean out have been completed, replace items in reverse order.

d) Use Teflon® tape on plug threads and wrench tighten.

e) Check operation thru several cycles and adjust settings if necessary.

RECOMMENDED SPARE PARTS

REF. NO.	ITEM	QTY.
16	SEAT	2
111	SEAL	2



11	Body
16	Seat
17	Stem
38	Plug
40	Rod
61	Nozzle
73	Bracket
75	Valve
82	Jet
87	Gland
100	Screw
111	Seal
119	Pipe
125	Washer
128	Pin
133	Coupling
139	Collar
140	Spring
140A	Spring
151	Float
163	Nameplate
187	Fork
206	Elbow
206A	Elbow
217	Piston
222	Rivet
261	Lever

Figure 2

PENBERTHY HOUDAILLE

Penberthy Division/Houdaille Industries
P.O. Box 112, Prophetstown, Illinois 61277
Telephone 815/537-2311 Telex 25 7339
Printed in U.S.A. Form No. 16204-009

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The R. F. James Company • Manufacturers Representatives

Atando Center
717-N Atando Avenue
Charlotte, N.C. 28206
(704) 334-3120

spirax sarco

RECEIVED
CHAS. T. MAIN, INC.
JAN 22 1987
CHARLOTTE, N. C.

December 16, 1986

Mr. Lindell Sunde
C. T. Main Inc. Engineers
Two Fairview Plaza
Charlotte, N. C. 28224

REF: SUMP PUMP TRAP ASSEMBLY, CHERRY POINT, N. C.

Dear Lindell:

Enjoyed talking with you this past week about the pumps for Cherry Point. Attached, please find the data sheets on these units. There are several advantages to using this unit in lieu of the Penberthy:

1) The cost of the initial unit is half that of Penberthy or others.

2) Direct replacement without piping changes.

3) Only one moving part (disc in steam trap).

4) The unit operates as a main drip as not to backup condensate in main header when not in use draining ground water from sump.

Please contact us if you have any questions.

Sincerely,

Bob James

Bob James, President
THE R. F. JAMES COMPANY, INC.

BJ/ev

cc: Bud Whitlock
Fred Watkins
Ellis Monroe

The R. F. James Company • Manufacturers Representatives

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Bob James

Bob James, President
THE R. F. JAMES COMPANY, INC.

BJ/ev

cc: Bud Whitlock
Fred Watkins
Ellis Monroe

Steam Traps • Temperature and Pressure Controls • Instrumentation

STEAM OPERATED SUMP PUMPS:

Spirax Sarco Model TD42GL, 304 stainless steel trap operator body, cap, disc, and strainer with GL series bronze steam syphon, rated at 150 psi steam inlet pressure.

OPERATION AND MOUNTING:

Mounting:

The Spirax Sarco liquid jet pump should be installed in a parallel position in the sump at the point at which desired liquid level is to be maintained. The piping to the TD42 steam operator inlet should be equal to that of the operator inlet size. The discharge piping of the type GL syphon jet pump should also be equal to that of syphon discharge outlet.

Operation:

As the water level rises in the sump equal to that of the TD42 operator cap, the flash steam above the disc condenses opening the operator. Inlet pressure steam then is discharged through the GL operator creating a high velocity syphon suction on the sump water. The incoming sump water is discharged to drain. As the water level recedes below the level of the TD42 cap the thermodynamic disc snaps closed shutting off steam flow to the GL syphon.

Capacity: 3/4" Spirax Sarco TD42GL 1"
Inlet Steam Pressure: 100 psig
Suction Lift: 2' Maximum
Discharge Hd From Pit Bottom: 10' Maximum
Pump GPM Capacity: 51 Gallons

spirax/sarco

LIQUID JET PUMPS

Available type

TD 42 with strainer screen and cap
TD 42 with strainer screen and blowdown valve

Limiting conditions

Maximum operating conditions
PMO - Max. operating pressure 600 psi *42 bar*
TMO Max. operating temperature 752°F *400°C*
Minimum pressure for satisfactory operation 3.5 psi *0.25 bar*
Maximum back pressure should not exceed 80% of the inlet pressure under any conditions of operation otherwise the trap may not shut
Maximum body design conditions PN 63
PMA - Max. allowable pressure 930 psi *62 bar*
TMA Max. allowable temperature 752°F *400°C*
Cold hydraulic test 899 psi *62 bar*

Sizes and pipe connections

1/2 L, 1/2 H and 3/4 H
Screwed NPT, API or BSP.

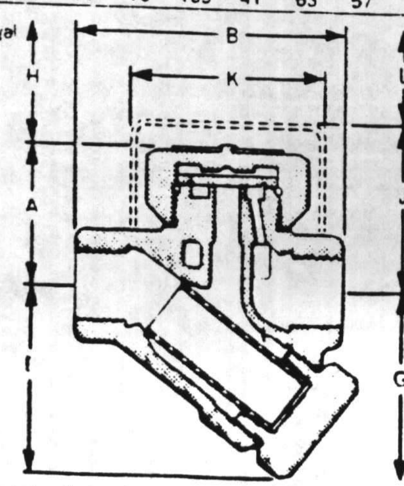
Materials

No	Part	Material	
1	Body	Stainless Steel	ASTM A743 Gr CA 40 F
2	Cap	Stainless Steel	AISI 416
3	Disc	Stainless Steel	BS 1449 420 S45
5	Strainer Screen	Stainless Steel	BS 1449 304 S16
6	Strainer Cap	Stainless Steel	AISI 416
	Insulcap (optional extra)	Aluminum	
8	Blowdown Cap	Stainless Steel	ASTM A 582 416
9	Blowdown Screw	Stainless Steel	ASTM A 276 431
10	Blowdown Valve	Stainless Steel	AISI 440 B

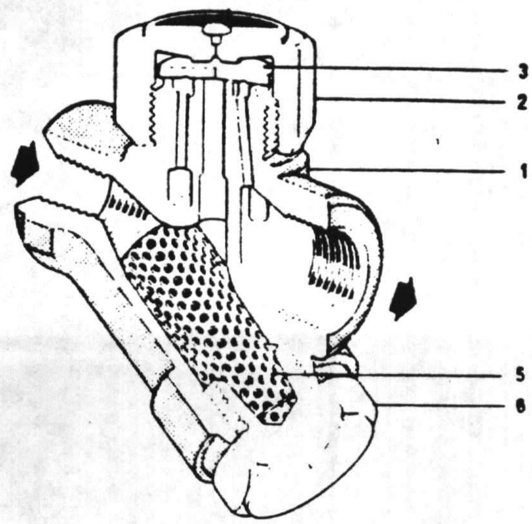
Dimensions (approximate) in millimeters & inches

TD 42

Size	A	B	E	G	H	J	K	L	Weight
1/2 L	1.6 *41*	3.1 *78*	2.2 *55*	3.4 *85*	1.6 *41*	2.3 *57*	2.3 *57*	1.5 *38*	1.65 lb *0.75 kg*
1/2 H	1.6 *41*	3.1 *78*	2.2 *55*	3.4 *85*	1.6 *41*	2.3 *57*	2.3 *57*	1.5 *38*	1.75 lb *0.8 kg*
3/4 H	1.9 *47*	3.5 *90*	2.4 *60*	4.0 *100*	1.6 *41*	2.5 *63*	2.3 *57*	1.5 *38*	2.2 lb *1 kg*
TD 42 with blowdown valve									
1/2 L	1.6 *41*	3.1 *78*	2.8 *71*	4.1 *103*	1.6 *41*	2.3 *57*	2.3 *57*	1.5 *38*	2.2 lb *1.0 kg*
1/2 H	1.6 *41*	3.1 *78*	2.8 *71*	4.1 *103*	1.6 *41*	2.3 *57*	2.3 *57*	1.5 *38*	2.3 lb *1.1 kg*
3/4 H	1.9 47	3.5 90	2.7 70	4.1 105	1.6 41	2.5 63	2.3 57	1.5 38	2.75 lb 1.25 kg



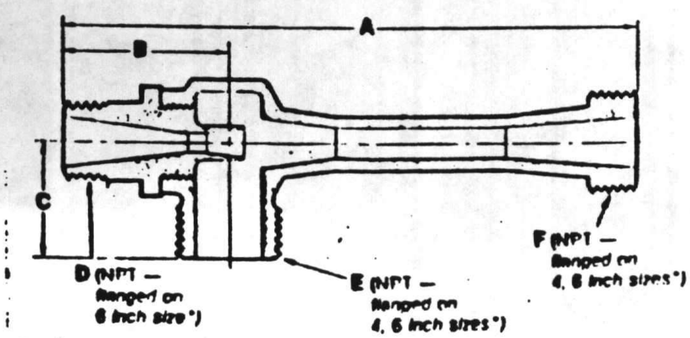
TD 42
with cap



CAST — GL,

SIZE	A	B	C	D*	E*	F*
1/2 A	4 5/8	1 1/2	1 1/4	1/4	1/2	1/2
1/2 B	4 3/8	1 1/2	1 1/4	1/4	1/2	1/2
1/2	4 1/2	1 9/16	1 1/4	3/8	1/2	1/2
3/4	5 1/16	2	1 1/2	1/2	3/4	3/4
1	7 1/16	2 1/4	1 3/4	3/4	1	1
1 1/4	9	2 1/2	2 1/4	1	1 1/4	1 1/4
1 1/2	11	2 3/4	2 1/2	1	1 1/2	1 1/2
2	14 3/8	3 1/8	3	1 1/4	2	2
2 1/2	18 1/8	3 1/2	4 1/8	1 1/2	2 1/2	2 1/2
3	23 1/8	4	5	2	3	3
4	32 1/8	5	6	3	4 *flange*	4 *flange*
6	47 3/8	5 5/8	5 1/2	4 *flange (blind tapped bolt holes)*	6 *flange (blind tapped bolt holes)*	6 *flange*

*All cast units have NPT connections except. 4 inch size has NPT inlet, flanged suction and discharge; 6 inch size has flanged inlet, suction and discharge (inlet and suction flanges on 6 inch size are blind tapped bolt holes).



PERFORMANCE (SUCTION CAPACITY Q_s in GPM)

SUCTION WATER TEMPERATURE 80°F (To) — OPERATING STEAM PRESSURE, PSIG (hm)

Suction Lift Ft. (hs)	Disch Hd in Feet (hd)	35		60		80		100		120		150	
		GL	GH	GL	GH	GL	GH	GL	GH	GL	GH	GL	GH
	0		50	56	63	56	61	61	56	62	55	64	53
	5		54	47	63	56	61	61	56	62	55	64	53
	10		39	36	63	50	61	61	56	62	55	64	53
	15		23	24	63	42	61	56	56	62	55	64	53
	20			13	63	33	61	48	56	62	55	64	53
	25				57	25	61	40	56	54	55	64	53
+5	30				47	17	61	29	56	46	55	64	53
	40				27		51	17	56	32	55	52	53
	50						41		56		55	38	53
	60								56		55	24	53
	70								40		55		53
	80										55		53
	100												53
	0		52	47	51	54	51	55	48	57	44	57	39
	5		52	38	51	54	51	55	48	57	44	57	39
	10		39	26	51	43	51	55	48	57	44	57	39
	15		23	16	51	33	51	48	48	57	44	57	39
	20				51	23	51	40	48	52	44	57	39
	25				51		51	34	48	44	44	57	39
5	30				47		51	21	48	37	44	57	39
	40				27		51		48	21	44	44	39
	50						41		48		44	29	39
	60								48		44		39
	70								40		44		39
	80										44		39
	100												39
	0		48	42	45	50	44	51	40	52	35	57	31
	5		48	30	45	48	44	51	40	52	35	52	31
	10		39	19	45	37	44	51	40	52	35	52	31
	15		23		45	27	44	43	40	52	35	52	31
	20				45	16	44	34	40	50	35	52	31
	25				45		44	25	40	41	35	52	31
-10	30				45		44	21	40	33	35	52	31
	40				27		44		40		35	41	31
	50						41		40		35	23	31
	60								40		35		31
	70								40		35		31
	80										35		31
	100												31
	0		40	36	37	45	36	46	31	45	26	43	23
	5		40	23	37	43	36	46	31	45	26	43	23
	10		30		37	30	36	46	31	45	26	43	23
	15		25		37	17	38	39	31	45	26	43	23
	20				37		36	29	31	45	26	43	23
	25				37		36	20	31	37	26	43	23
-15	30				37		38		31	27	26	43	23
	40				27		38		31		26	30	23
	50						36		31		26		23
	60								31		26		23
	70								31		26		23
	80										26		23
	100												23
	0		31	31	26	35	25	32	21	32	17	29	15
	5		31		26	35	25	32	21	32	17	29	15
	10		23		26	30	25	32	21	32	17	29	15
	15				26	17	25	32	21	32	17	29	15
	20				26		25	29	21	32	17	29	15
	25				26		25		21	32	17	29	15
-20	30				26		25		21		17	29	15
	40						25		21		17		15
	50								21		17		15
	60								21		17		15
	70								21		17		15
	80										17		15
	100												15

SUCTION WATER TEMPERATURE 120°F (To) — OPERATING STEAM PRESSURE, PSIG (hm)

Suction Lift Ft. (hs)	Disch Hd in Feet (hd)	35		60		80		100		120		150	
		GL	GH	GL	GH	GL	GH	GL	GH	GL	GH	GL	GH
	0		54	56	50	58	48	58	45	55	45	53	43
	5		54	56	50	58	48	58	45	55	45	53	43
	10		54	47	50	58	48	58	45	55	45	53	43
	15		54	29	50	48	48	58	45	55	45	53	43
	20			16	50	38	48	58	45	55	45	53	43
	25				50	24	48	47	45	55	45	53	43
+5	30				50	12	48	37	45	53	45	53	43
	40				25		48	15	45	27	45	53	43
	50						48		45		45	53	43
	60								45		45		43
	70								40		45		43
	80										45		43
	100												43
	0		42	48	37	47	37	44	36	42	34	42	30
	5		47	42	37	47	37	44	36	42	34	42	30
	10		42	29	37	47	37	44	36	42	34	42	30
	15		42	16	37	37	37	44	36	42	34	42	30
	20				37	24	37	44	36	42	34	42	30
	25				37		37	35	36	42	34	42	30
5	30				37		37	25	36	42	34	42	30
	40				25		37		36	27	34	42	30
	50						37		36		34	27	30
	60								36		34		30
	70								36		34		30
	80												30
	100												30
	0		35	39	32	38	32	37	31	36	26	36	23
	5		35	35	32	38	32	37	31	38	26	36	23
	10		35	27	32	38	32	37	31	36	28	38	23
	15		35	16	32	29	32	37	31	38	28	36	23
	20				32	16	32	37	31	38	26	36	23
	25				32		32	28	31	36	26	36	23
-10	30				32		32		31	38	26	36	23
	40				25		32		31		26	36	23
	50						32		31		26		23
	60								31		26		23
	70								31		26		23
	80										26		23
	100												23
	0		26	31	26	30	26	30	21	30	17	30	15
	5		26	27	26	30	26	30	21	30	17	30	15
	10		26		26	30	26	30	21	30	17	30	15
	15		26		26	23	26	30	21	30	17	30	15
	20				26		26	30	21	30	17	30	15
	25				26		20	18	21	30	17	30	15
-15	30				26		28		21	27	17	30	15
	40				25		26		21		17	30	15
	50						28		21		17		15
	60								21		17		15
	70								21		17		15
	80										17		15
	100												15
	0		18	22	16	24	14	22		20		19	
	5		18	12	16	24	14	22		20		19	
	10		18		16	24	14	22		20		19	
	15		18		16	24	14	22		20		19	
	20		18		16		14	22		20		19	
	25				16		14			20		19	
-20	30				16		14			20		19	
	40											19	
	50												
	60												
	70												
	80												
	100												

SUCTION WATER TEMPERATURE 150°F (To) — OPERATING STEAM PRESSURE, PSIG (hm)

Suction Lift Ft. (hs)	Disch Hd in Feet (hd)	35		60		80		100		120		150	
		GL	GH	GL	GH	GL	GH	GL	GH	GL	GH	GL	GH
	0		30	47	35	42	34	41	33	41	33	41	33
	5		30	47	35	42	34	41	33	41		41	
	10		30	47	35	42	34	41	33	41		41	
	15		30	32	35	42	34	41	33	41		41	
	20		30		35	42	34	41	33	41		41	
	25				35	28	34	41	33	41		41	
+5	30				35		34	41	33	41		41	
	40				35		34		33	35		41	
	50						34		33			41	
	60								33				
	70								33				
	80												
	100												
	0		23	30	24	29	24	29	24	29	24	30	21
	5		23	30	24	29	24	29	24	29		30	
	10		23	30	24	29	24	29	24	29		30	
	15		23		24	29	24	29	24	29		30	
	20				24	28	24	29	24	29		30	
	25				24		24	29	24	29		30	
5	30				24		24	24	24	29		30	
	40				24		24		24	19		30	
	50						24		24			30	
	60								24				
	70								24				
	80												
	100												
	0		16	23	17	22	18	24	19	23	16	21	
	5		16	23	17	22	18	24	19	23		23	
	10		16	23	17	22	18	24	19	23		23	
	15		16		17	22	18	24	19	23		23	
	20				17		18	24	19	23		23	
	25				17		18	24	19	23		23	
-10	30				17		18		19	23		23	
	40				17		18		19			23	
	50						18		19				
	60								19				
	70								19				
	80												
	100												
	0			16		14		16		16		15	
	5			16		14		16		16		15	
	10					14		16		16		15	
	15					14		16		16		15	
	20							16		16		15	
	25									16		15	
-15	30									16		15	
	40											15	
	50												
	60												
	70												
	80												
	100												
	0												
	5												
	10												
	15												
	20												
	25												
-20	30												
	40												
	50												
	60												
	70												
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	100												

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THIS PUBLICATION INCLUDES THE FOLLOWING SECTIONS:

(1) ANSI/ASHRAE/IES 90A-1980 (SUPERSEDES SECTIONS 1-9 OF ASHRAE/IES STANDARD 90-75)

(2) ASHRAE/IES 90B-1975 (SECTIONS 10 AND 11 OF ASHRAE/IES STANDARD 90-75)

(3) ASHRAE 90C-1977 (SECTION 12 AS PUBLISHED FEBRUARY 16, 1977)

CLARIFICATION OF THE STATUS OF EACH SECTION IS INCLUDED IN THE FOREWORD.

ASHRAE STANDARD

ENERGY CONSERVATION IN NEW BUILDING DESIGN

ASHRAE Standards are updated on a five-year cycle; the date following the Standard number is the year of approval. The latest copies may be purchased from the ASHRAE Publication Sales Department, 1791 Tullie Circle, NE, Atlanta, GA 30329
York, N.Y. 10017.

Cosponsored by

The American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
and
Illuminating Engineering Society of North America

1791 Tullie Circle NE, Atlanta, GA 30329

Table 5.1
Minimum Pipe Insulation

Piping System Types	Fluid Temperature Range		Insulation Thickness for Pipe Sizes*					
			Runouts 2 in.**	(1 in.) and Less	1 ¼-2 in.	2½-4 in.	5 & 6 in.	(8 in.) and Larger
	°C	F	in.	in.	in.	in.	in.	in.
Heating Systems								
Steam & Hot Water								
High Pressure/Temp	152-238	306-450	1.5	2.5	2.5	3.0	3.5	3.5
Medium Pressure/Temp	122-151	251-305	1.5	2.0	2.5	2.5	3.0	3.0
Low Pressure/Temp	94-121	201-250	1.0	1.5	1.5	2.0	2.0	2.0
Low Temperature	49-93	120-200	0.5	1.0	1.0	1.5	1.5	1.5
Steam Condensate (for Feed Water)	Any	Any	1.0	1.0	1.5	2.0	2.0	2.0
Cooling Systems								
Chilled Water,	4.5-13	40-55	0.5	0.5	0.75	1.0	1.0	1.0
Refrigerant, or Brine	Below 4.5	Below 40	1.0	1.0	1.5	1.5	1.5	1.5

*See 5.10.1 and 5.10.2 (Pipe sizes are nominal dimensions.) For piping exposed to ambient temperatures, increase thickness by 0.5 in.
**Runouts to Individual Terminal Units (not exceeding 12 ft in length)

5.10.2 The required minimum thicknesses do not consider condensation. Additional insulation with vapor barriers may be required to prevent condensation under some conditions.

5.11 Air Handling Duct System Insulation

All ducts, plenums and enclosures installed in or on buildings shall be thermally insulated as follows:

5.11.1 All duct systems, or portions thereof, shall be insulated to provide a thermal resistance, excluding film resistances, of

$$R = \frac{\Delta t}{47.3}\ m^2 \cdot {}^\circ C/W \quad \left(R = \frac{\Delta t}{15}\ ft^2 \cdot h \cdot F/Btu\right)$$

Where Δt = the design temperature differential between the air in the duct and the duct surface in °C (F).

Table 5.2
Required R Factors

Δt°C	R	ΔtF	R
15	0.32	27	1.8
30	0.63	54	3.6
45	0.95	81	5.4
60	1.30	108	7.2
75	1.60	136	9.1
90	1.90	162	11.0

For residential buildings with uninsulated roofs over attics containing ducts the air temperatures shown in Table 5.3 shall be used.

Table 5.3
Residential Attic Temperatures

Summer Conditions Roof Pitch	°C	F
5 in 12 and up	54	130
3 in 12 to 5 in 12	60	140
Less than 3 in 12	66	150
Winter conditions		
All Pitches 5.5°C (10 F) over Outdoor Design		

Exceptions. Duct insulation is not required in any of the following cases:

a. Where Δt is 14 °C (25F) or less

b. Where supply or return air ducts are installed in basements, cellars or unventilated crawl spaces having insulated walls in one- and two-family dwellings

c. When the heat gain or loss of the ducts, without insulation, will not increase the energy requirements of the building

d. Within HVAC equipment

e. Exhaust air ducts

5.11.2 Uninsulated ducts in uninsulated sections of exterior walls and in attics above the insulation might not meet the requirements of this Standard.

5.11.3 The required thermal resistances do not consider condensation. Additional insulation with vapor barriers may be required to prevent condensation under some conditions.

5.12 Duct Construction

All ductwork shall be constructed and erected in accordance with the following SMACNA standards:

a. Heating and Air Conditioning Systems Installation Standards, 3rd edition February 1977[21]

b. Low Pressure Duct Construction Standards, 5th edition, 1976[22]

c. High Pressure Duct Construction Standards, 3rd edition, 1975[23]

d. Fibrous Glass Duct Construction Standards, 4th edition, 1975[24]

5.12.1 High-pressure and medium-pressure ducts shall be leak tested in accordance with the applicable SMACNA Standard, with the rate of leakage not to exceed the maximum rate specified in that standard.

5.12.2 There is no standard at this time for leak testing of low pressure ducts. When low pressure supply air ducts are located outside of the conditioned space (except return air plenums), all transverse joints shall be

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APPENDIX F
INSULATION COSTS
$/LINEAL FT

REFERENCE: 1987 MEANS MECHANCAL COST DATA
MATERIAL: Fiberglass with all service jacket

PIPE SIZE	INSULATION THICKNESS														
	1"			1 1/2"			2"			2 1/2"			3"		
(IN.)	MAT'L	LABOR	TOTAL	MAT'L	LABOR	TOTAL	MAT'L	LABOR	TOTAL	MAT'L	LABOR	TOTAL	MAT'L	LABOR	TOTAL
1/2	1.05	1.38	2.43	2.23	1.44	3.67	3.58	1.51	5.09						
3/4	1.20	1.44	2.64	2.31	1.51	3.82	3.72	1.58	5.30						
1	1.27	1.51	2.78	2.46	1.58	4.04	3.98	1.66	5.64						
1 1/4	1.40	1.58	2.98	2.68	1.66	4.34	4.23	1.74	5.97	5.73	1.82	7.55			
1 1/2	1.56	1.58	3.14	2.83	1.66	4.49	4.42	1.14	6.16	5.92	1.82	7.74			
2	1.69	1.66	3.35	3.10	1.74	4.84	4.63	1.84	6.47	6.13	1.94	8.07			
2 1/2	1.89	1.74	3.63	3.37	1.84	5.21	4.99	1.95	6.94	6.60	2.05	8.65			
3	2.10	1.84	3.94	3.50	1.95	5.45	5.32	2.07	7.39	7.12	2.19	9.31			
3 1/2	2.31	1.95	4.26	4.01	2.07	6.08	5.76	2.21	7.97	7.56	2.35	9.91			
4	2.74	2.21	4.95	4.23	2.37	6.60	6.18	2.55	8.73	8.08	2.70	10.78			
5	3.15	2.37	5.52	4.51	2.55	7.06	7.01	2.76	9.77	9.50	2.96	12.46	12.00	3.16	15.16
6	3.37	2.76	6.13	4.64	3.01	7.65	7.16	3.31	10.47	9.66	3.61	13.27	12.16	3.91	16.07
8	4.88	3.31	8.19	5.79	3.68	9.47	8.89	4.14	13.03	11.89	4.64	16.53	14.89	5.14	20.03
10	5.76	3.68	9.44	7.37	4.14	11.51	10.67	4.73	15.40	14.00	5.33	19.33	17.30	5.93	23.23
12	6.57	4.14	10.71	8.07	4.42	12.49	11.81	5.10	16.91	15.50	5.80	21.30	19.20	6.50	25.70