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Ancient Monuments Laboratory
Report 33/98

TREE-RING ANALYSIS OF TIMBERS FROM FALMER COURT BARN, FALMER, EAST SUSSEX

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Summary

Sampling and analysis by tree-ring dating of Falmer Court barn were commissioned by English Heritage. The purpose of this was to complement the Archaeological Interpretative survey and to provide additional information ahead of a major programme of timberwork repairs and re-thatching. The sampling request asked the Laboratory to concentrate on establishing a felling date and thus a possible construction sequence for what have been labelled phases B1 and B2. The laboratory was also asked to date the felling of timber used in phase E1 and, if possible, given the limited amount of timber available, a date for the felling of timbers used in phase C2. Thus, dendrochronological analysis was undertaken of samples from thirty-eight oak timbers at this site. This resulted in the production of one dated site chronology and one undated site sequence. The dated site chronology is composed of seventeen samples. Most of the dated samples are from phases B1 and B2, with one sample being from phase E1 and one sample from phase C2. The undated site sequence is made up exclusively of samples from phase E1. The dated site chronology has 112 rings, and spans the period AD 1386 to AD 1497. Interpretation of the sapwood on the samples suggests that there is only a vey short time gap, if any at all, between the felling of any of the timber represented. It is estimated that the felling of timber for phases B1 and B2 took place some time in the range AD 1505 - 1525. A second, undated, sequence was also created from eight samples of another distinct segment of the building labelled E1. This undated sequence has 84 rings. The objectives are thus met in part. Phases B1 and B2 are shown to be of a very similar date whilst the construction phase C1 appears to be represented by reused timber and thus the phase itself is not dated. Phase E1 is not dated either but it would appear to be different from that of B1 and B2.

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Introduction

Falmer Court Barn, Falmer, East Sussex (TQ 356088, see map, Fig 1) has been the subject of a detailed and thorough-going Archaeological Interpretative Survey by David and Barbara Martin (1994) on which much of this introduction and the interpretation of the site in this report is based. It contains a detailed architectural description which defines a number of phases within the barn. These range from a central section, phase A1 (now destroyed), flanked by subsequent work (phases B1 and B2) believed to be late medieval to sixteenth and seventeenth century phases. There were modifications to the aisles (phases C1 and C2) believed to date from the fifteenth or sixteenth century, and alterations (phase D), probably in the seventeenth century. The phase A central section was replaced during phase E (probably *c* AD 1700). Phases F and G represent sundry alterations believed to belong to the mid- to late-eighteenth century and nineteenth century respectively. A plan from the survey and report, showing the phases of the barn, is reproduced here as Figure 2.

The barn is a fourteen-bayed aisle structure with fourteen principal trusses, designated A - P but excluding the letters I and O, from west to east. The low eastern end wall, being in effect the side wall of the return end aisle, is not designated by letters. The trusses consist of variations on arcade posts, tiebeams with arched braces, crown posts and collars with principal rafters, aisle-ties, and wall posts. Each individual timber has been surveyed and assessed and given an individual timber number.

Since phase A1 is now destroyed, the earliest parts of the surviving building are the two end sections, both of which appear to be medieval in date though apparently (to judge from differences in design) of different periods. Following the Archaeological Interpretative Survey these are referred to as periods B1 (east end) and B2 (west end). The survey could not clearly reveal which of these phases is the earlier. Carpenters' marks confirm that sections B1 and B2 are both complete and that the space between them (rebuilt as period E) must have been occupied by a frame of an earlier period. Whether the surviving period B1 and B2 sections represent extensions or a partial rebuild of the earlier structure is unclear. Reused material incorporated into its successor, the period E building, may originate from the period A structure though such timbers do not appear to be of any markedly different date from those of the surviving period B work.

According to the survey, shortly after the work on the period B1 and B2 parts was completed the eastern end wall was reconstructed in stone, this being referred to as period C1. Soon afterwards the eastern end of the south wall was reconstructed involving the replacement of some of the aisle timberwork. The Survey designates this as period C2 and it is represented by only three timbers.

At around 1700 the central section period A building (between sections B1 and B2) was demolished and replaced by five new bays with a butt-purlin roof. This is designated phase E. The bays within this rebuild are noticeably shorter than those of B1 and B2.

Sample analysis and dating

A total of thirty-eight oak timbers was sampled by coring. Each sample was given the code FAL-A (for Falmer, site "A") and numbered 01 - 38. Ten samples, FAL-A01 - 10, were obtained from timbers of phase B2. Fifteen samples, FAL-A11 - 25, were obtained from phase E1. Ten samples, FAL-A26 - 30 and FAL-A33 - 37, were obtained from phase B1, with samples FAL-A31 and A32

being taken from the only two suitable timbers representing phase C2. Sample B38 is also probably of phase B1 but is not listed in the report as such.

The positions of the cores were recorded at the time of sampling on a drawing taken from the Archaeological Interpretative Survey and reproduced here as Figure 3. The details of all the samples are also given in Table 1. In this Table the member type sampled is given, ie arcade post, rafter etc, along with its timber reference number and its period or phase code. Samples FAL-A33 and A34 come from a timber which appears to have one reference number, but appears to be two timbers. Samples FAL-A35 - 38, the jack-rafters, are not individually numbered. The position and truss designation follow those given in the Archaeological Survey. Upon preparation it was found that two of the thirty-eight samples, FAL-A29 and FAL-A32, had too few rings for reliable analysis and so these were not measured.

The ring-width sequences of the remaining thirty-six samples were measured and compared with each other by the Litton/Zainodin grouping procedure (see Appendix). At a value of t=4.5 two groups of samples formed.

The seventeen samples of the first group cross-match with each other at the off-sets shown in Figure 4. These were combined at these relative offsets to form FALASQ01, a site chronology of 112 rings. This site chronology includes several timbers from phases B1 and B2, the single measured sample from one of the two timbers from phase C2 (only three timbers being available) and a single sample from a timber of phase E1.

Site chronology FALASQ01 was successfully cross-matched with a series of relevant reference chronologies for oak, giving a first ring date of AD 1386 and a last measured ring date of AD 1497. Evidence for this dating is given by the t-values of Table 2. Site chronology FALASQ01 was compared with the remaining ungrouped samples but there was no further satisfactory cross-matching.

Taken overall, the average last heartwood ring date of the samples in site chronology FALASQ01 is AD 1490. The usual 95% confidence limit for sapwood on mature oaks from south-east England is in the range 15 to 35 rings. This would give the timber represented by these samples an estimated felling date in the range AD 1505 - 1525.

The eight samples of the second group to form at t=4.5 by the Litton/Zainodin grouping procedure cross-match each other at the off-sets shown in Figure 5. These eight samples were combined at these relative offsets to form FALASQ02, a site chronology of 84 rings. This site chronology includes only samples of timbers from phase E1. Site chronology FALASQ02 was compared with a full range of relevant reference chronologies for oak, but there was no satisfactory cross-matching at any position, and these samples must, therefore, remain undated.

Site chronology FALASQ02 was compared with the remaining ungrouped samples but there were no further satisfactory cross-matches. The two site chronologies were compared with each other, but again there was no satisfactory cross-matching. Each of the eleven remaining ungrouped samples was compared separately with the reference chronologies but no satisfactory cross-matches were indicated.

Conclusion

From the analysis it would appear that the objectives are met in part. Phases B1 and B2 were built some time in the range AD 1505 to 1525 and do indeed date to the late medieval period. It has not been possible to distinguish a difference in felling date between timbers of the two sections. If the average last heartwood ring date of samples from phase B1 only is taken, AD 1489, we obtain an estimated felling date in the range AD 1504 - 1524. If that of samples from phase B2 only is taken, AD 1488, we obtain an estimated felling date in the range AD 1503 - 1523. It is likely that all the timbers were felled at the same time in a single construction programme, or within, say, a few years

of each other. Given the quality of the cross-matching within and between the groups it is possible that we have here a single source of timber for both phases.

Although one of the three available timbers from phase C2 has been dated, it may be a reused piece, possibly from the portion disturbed by the reconstruction at this time. There was, however, no evidence of this on the timber by way of redundant mortises or peg holes. Thus, the construction date of phase C2 itself has not been determined. Given the tree-ring evidence, some re-interpretation of the phasing of this work may be necessary.

Although a group of samples from timbers of phase E1 cross-match to form a site sequence it has not been possible to date this. This would suggest that the most of the timbers of phase E1 are of a single, distinct, construction phase and that this is different to that of phase B1 and B2. It may be noted, however, that three of the samples in this site sequence, samples FAL-A17, A19, and A24, do have relative heartwood/sapwood transitions later than the others in this sequence. It is possible that at least two felling phases are represented by this sequence.

Based on stylistic evidence phase E1 is probably later than B1, B2, and C2, but this cannot be proven by tree-ring dating. If the samples from period E1 are later the lack of dating may in part be due to there being no relevant reference material.

Only one sample from phase E, FAL-A14, has been dated. It may be reused, though there is no evidence of this by way of redundant mortises or peg holes.

Of the thirty-six samples measured eleven remain ungrouped and undated. Some of these are short and might not be expected to date individually. Others, however, do have sufficient number of rings for satisfactory analysis and might be expected to date. Some of these samples have quite wide rings and show some complacency in their growth pattern. This, and the possible lack of reference material from this area of England for the expected period may help explain this lack of dating.

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Table 1: Details of tree-ring samples from Falmer Court Barn, Falmer, East Sussex

Sample no.	Sample location	Interpretative Survey Timber reference no	Phase code	Total rings	Sapwood rings*	First measured ring date	Last heartwood ring date	Last measured ring date
FAL-A01	Tiebeam, truss A	01004	B2	90	h/s	AD 1398	1487	1487
FAL-A02	South arcade post, truss A	01006	B2	84	h/s	AD 1408	1491	1491
FAL-A03	North arcade post, truss B	02002	B2	91	no h/s	AD 1386	------	1476
FAL-A04	North arcade post, truss D	04001	B2	47	h/s	AD 1443	1489	1489
FAL-A05	North aisle-tie, truss D	04002	B2	84	01	AD 1405	1487	1488
FAL-A06	South arcade post, truss D	04006	B2	85	01	AD 1407	1490	1491
FAL-A07	North arcade post, truss E	05001	B2	48	01	------	------	------
FAL-A08	North aisle-tie, truss E	05002	B2	86	no h/s	AD 1397	------	1482
FAL-A09	South arcade post, truss E	05006	B2	83	h/s	------	------	------
FAL-A10	North raking shore, truss E	05026	B2	84	h/s	------	------	------
FAL-A11	North arcade post, truss F	06001	E1	57	06	------	------	------
FAL-A12	South aisle tie, truss F	06007	E1	47	01	------	------	------
FAL-A13	North raking shore, truss F	06025	E1	64	h/s	------	------	------
FAL-A14	North arcade post, truss G	07001	E1	56	01	AD 1431	1485	1486
FAL-A15	North brace, truss G	07003	E1	48	04	------	------	------
FAL-A16	Tiebeam, truss G	07004	E1	55	06	------	------	------
FAL-A17	South aisle-tie, truss G	07007	E1	54	h/s	------	------	------
FAL-A18	North principal rafter, truss G	07027	E1	55	01	------	------	------
FAL-A19	North arcade post, truss H	08001	E1	60	08	------	------	------
FAL-A20	South arcade post, truss H	08006	E1	57	02	------	------	------
FAL-A21	North principal rafter, truss H	08025	E1	61	h/s	------	------	------
FAL-A22	North arcade post, truss J	09001	E1	124	h/s	------	------	------
FAL-A23	Tiebeam, truss J	09004	E1	54	10	------	------	------
FAL-A24	South arcade post, truss J	09006	E1	80	h/s	------	------	------
FAL-A25	North arcade plate, truss H-K	60003	E1	57	05	------	------	------

Table 1: Continued

Sample no.	Sample location	Interpretative Survey Timber reference no	Phase code	Total rings	Sapwood rings*	First measured ring date	Last heartwood ring date	Last measured ring date
FAL-A26	North arcade post, truss K	10001	B1	55	h/s	AD 1443	1497	1497
FAL-A27	North arcade post, truss L	11001	B1	54	h/s	------	------	------
FAL-A28	South arcade post, truss L	11006	B1	61	h/s	AD 1425	1485	1485
FAL-A29	South arcade post, truss M	12006	B1	NM	h/s	------	------	------
FAL-A30	South arcade post, truss N	13006	B1	46	h/s	AD 1442	1487	1487
FAL-A31	South aisle-tie, truss P	14007	C2	62	h/s	AD 1431	1492	1492
FAL-A32	South raking shore, truss P	14009	C2	NM	h/s	------	------	------
FAL-A33	Wall plate to east gable (1)	15001(a)	B1	69	no h/s	AD 1416	------	1484
FAL-A34	Wall plate to east gable (2)	15001(b)	B1	43	no h/s	AD 1427	------	1469
FAL-A35	East jackrafter 1	15028(a)	B1	66	h/s	------	------	------
FAL-A36	East jackrafter 2	15028(b)	B1	72	h/s	AD 1420	1491	1491
FAL-A37	East jackrafter 3	15028(c)	B1	57	h/s	AD 1431	1487	1487
FAL-A38	East jackrafter 4	no number	none	66	h/s	AD 1424	1489	1489

*h/s = the heartwood/sapwood boundary is the last ring on sample
NM = sample not measured

Table 2: Results of the cross-matching of site chronology FALASQ01 and relevant reference chronologies when first ring date is AD 1386 and last ring date is AD 1497

Reference Chronology	Span of chronology	t-value	
East Midlands	AD 882 - 1981	6.7	(Laxton and Litton 1988)
British Isles	AD 401 - 1981	6.0	(Baillie and Pilcher 1982 unpubl)
Southern England	AD 1083 - 1589	5.3	(Bridge 1988)
Kent-88	AD 1158 - 1540	6.3	(Laxton and Litton 1989)
Sittingbourne Manor, Kent	AD 1368 - 1520	5.2	(Howard *et al* 1988)
Restoration House, Rochester, Kent	AD 1378 - 1505	6.3	(Howard *et al* 1997)
Wickham, Hants	AD 1373 - 1503	5.2	(Howard et al 1991 unpubl)
27 High St, Lymington, Hants	AD 1387 - 1667	4.9	(Esling *et al* 1990)

Figure 1: Map to show general location of Falmer, East Sussex

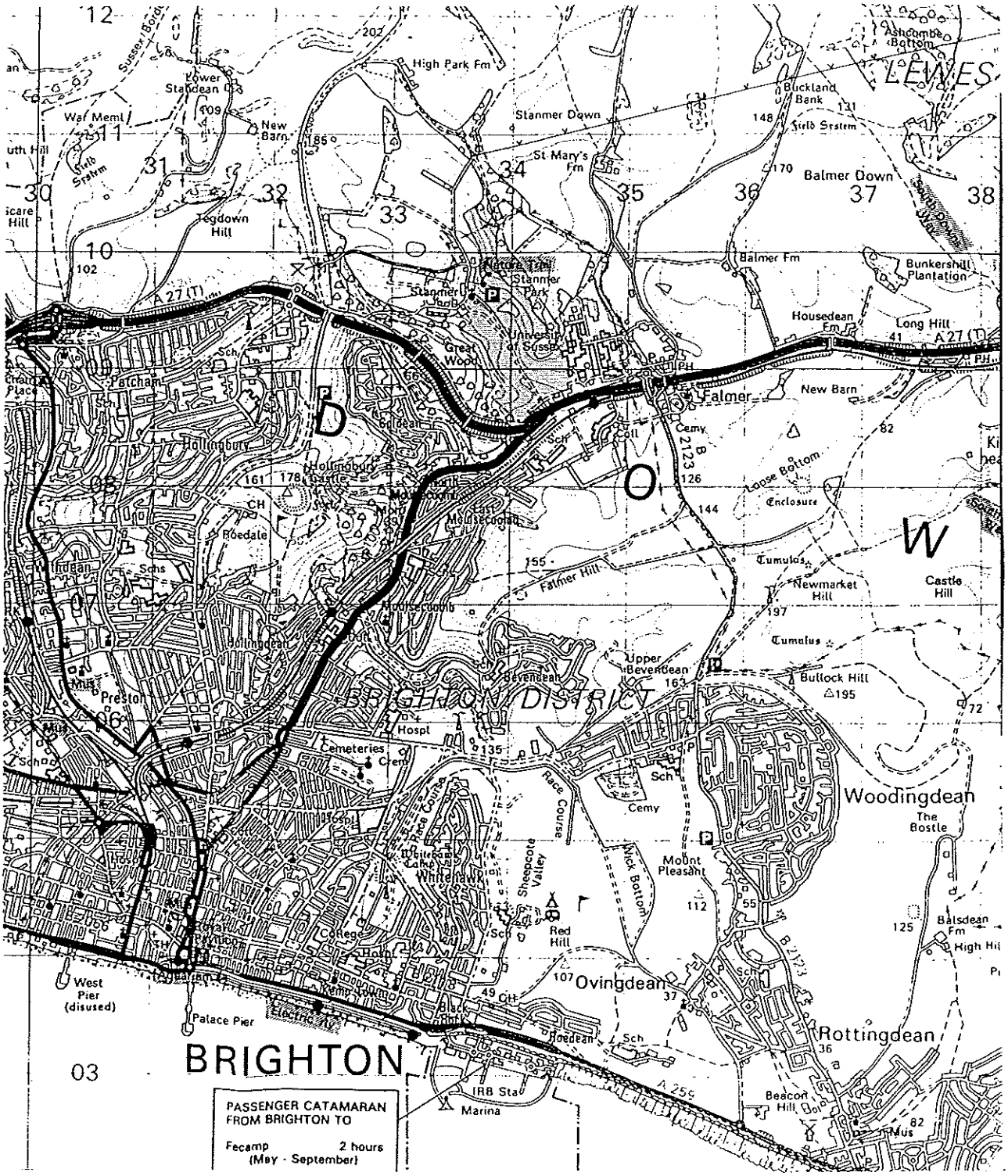
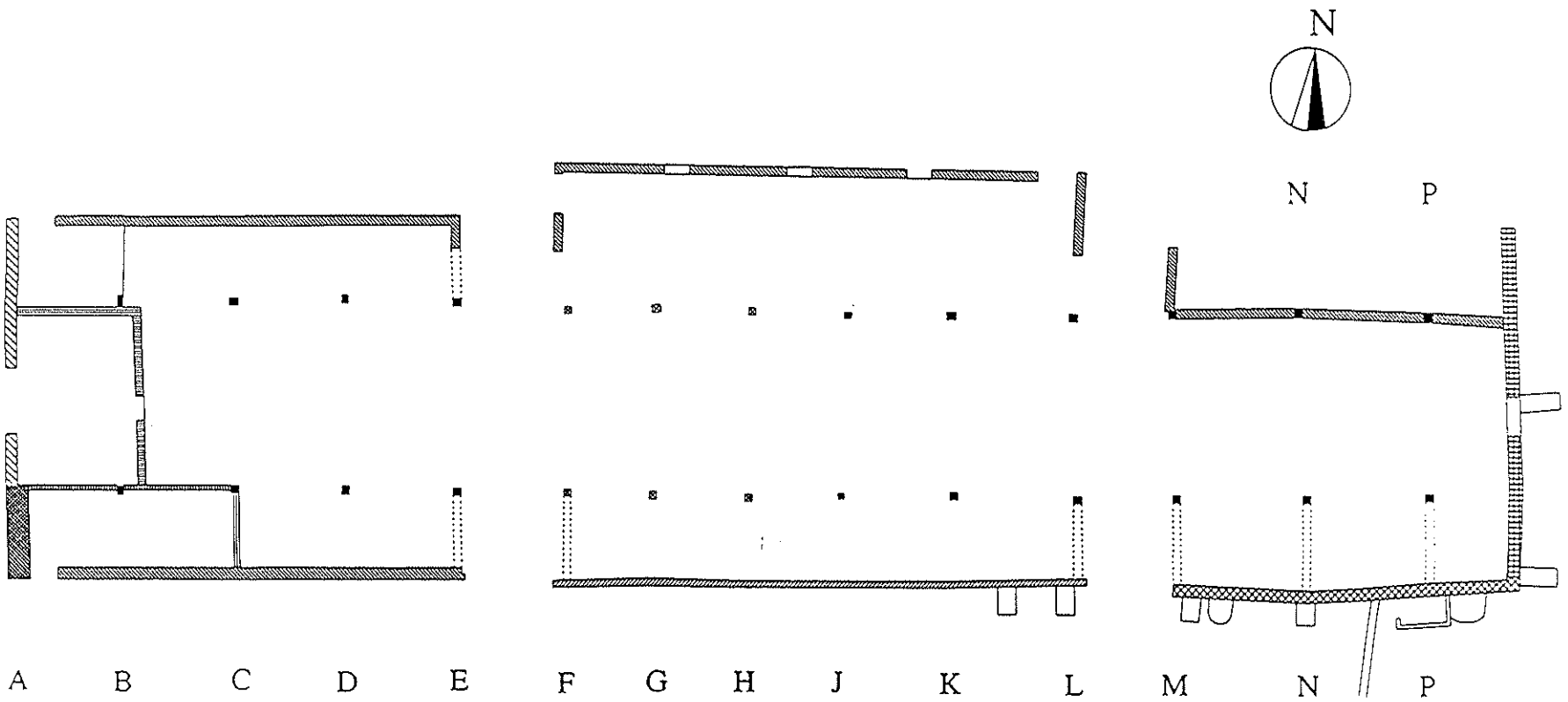


Figure 2: Plan to show construction phases of Falmer Court Barn



PERIODS B1 & B2 (LATE MEDIEVAL)
PERIOD C1 (15th or 16th CENTURY)
PERIOD C2 (15th or 16th CENTURY)
PERIOD D (17th CENTURY OR EARLIER)
PERIOD E1 (c.1700)
PERIOD F (MID-LATE 18th CENTURY)
PERIOD G1 (MID 19th CENTURY)
PERIOD G (19th CENTURY)
PERIOD G3 (LATE 19th CENTURY)
PERIOD G4 (LATE 19th CENTURY)

Figure 3: Plan to show approximate location of samples

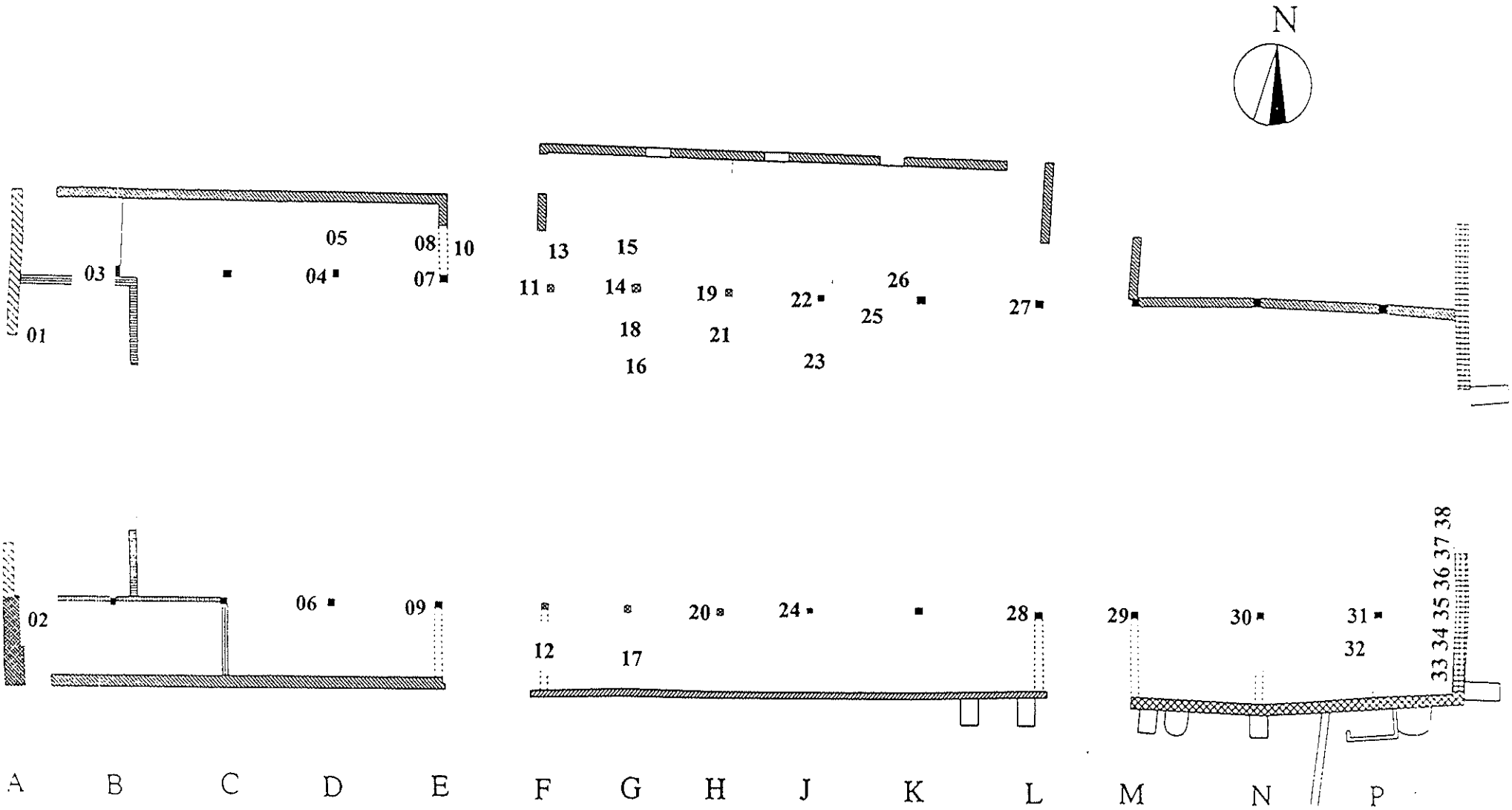
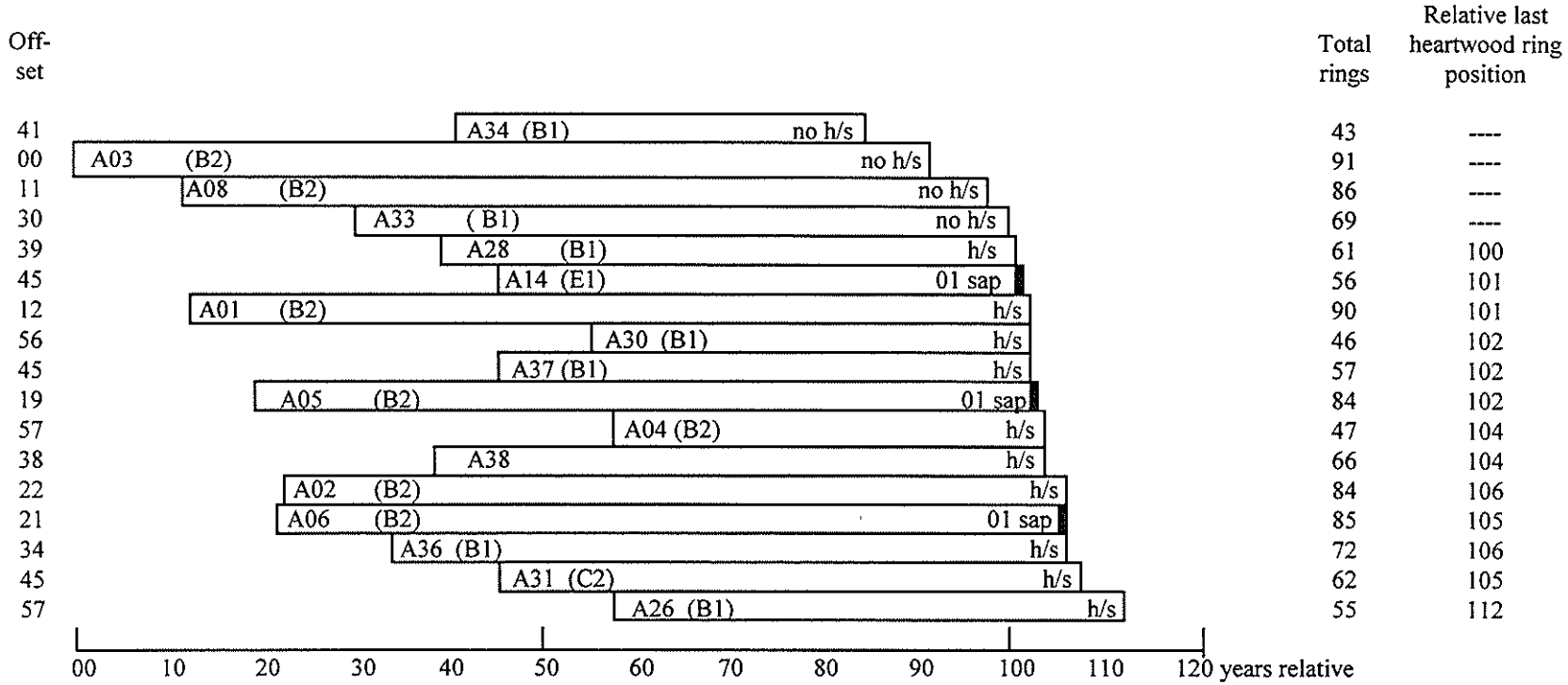
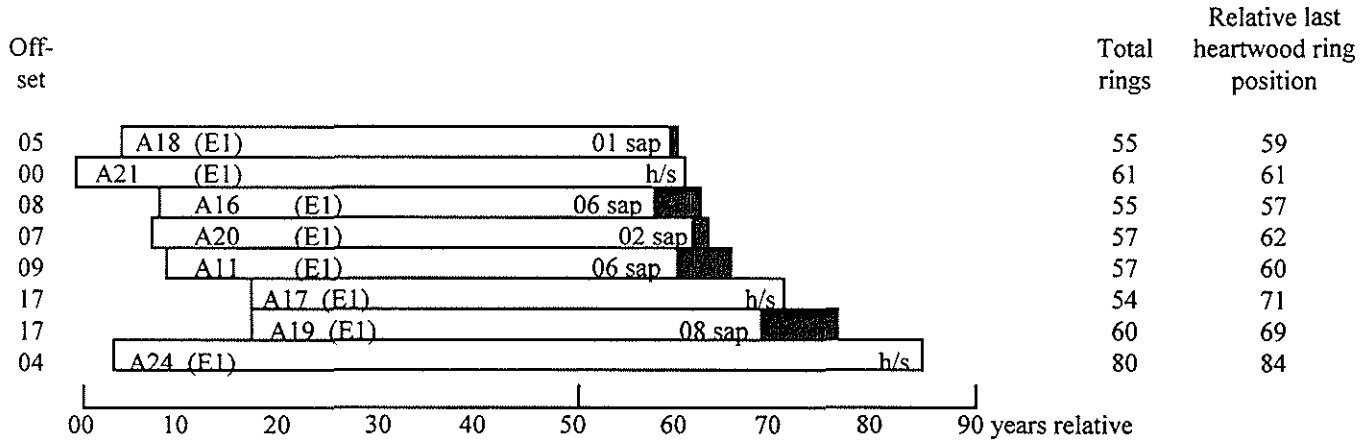


Figure 4: Bar diagram of samples in site chronology FALASQ01



White bar = heartwood rings, shaded area = sapwood rings
h/s = the heartwood/sapwood boundary is the last ring on sample

Figure 5: Bar diagram of samples in site chronology FALASQ02



White bar = heartwood rings, shaded area = sapwood rings
h/s = the heartwood/sapwood boundary is the last ring on sample

Data of measured samples - measurements in 0.01mm units

FAL-A01A 90
288 218 506 333 292 279 372 443 368 357 399 417 372 314 295 419 341 317 211 135
265 283 262 302 214 326 272 304 300 169 83 128 71 183 177 219 205 156 128 124
88 100 139 144 126 172 113 92 86 135 101 157 103 100 88 74 95 134 115 129
152 120 137 106 123 199 194 152 231 151 122 124 149 115 146 150 132 155 132 55
106 167 142 184 182 192 182 160 171 190
FAL-A01B 90
274 302 507 326 306 268 380 463 357 370 382 429 374 331 309 408 347 321 207 140
282 288 260 298 223 318 280 297 302 167 87 125 70 175 181 220 208 161 117 120
97 85 153 136 129 172 115 90 80 131 102 142 109 97 92 67 99 134 119 140
153 121 143 99 121 203 200 149 232 145 133 115 152 126 146 133 152 160 119 70
102 164 148 183 179 190 187 165 175 196
FAL-A02A 84
263 316 269 372 282 267 224 321 301 315 406 223 227 190 143 264 297 298 257 186
193 114 122 166 158 208 189 196 146 176 148 107 127 106 96 109 117 100 66 68
91 143 115 118 133 124 91 111 116 190 139 75 98 79 67 85 93 92 111 84
81 91 123 115 132 118 128 138 107 67 66 60 86 139 114 184 115 102 185 208
130 141 104 122
FAL-A02B 84
296 287 274 364 273 267 220 316 294 299 405 220 228 188 149 252 305 292 262 176
200 110 123 169 162 202 189 191 141 177 149 118 120 115 100 117 101 102 67 78
87 144 110 124 129 118 94 117 118 183 131 78 98 80 69 90 88 87 97 86
79 95 124 116 127 117 139 132 104 61 61 63 90 136 126 165 134 104 180 217
125 136 106 114
FAL-A03A 91
398 391 452 478 393 514 452 529 382 448 424 334 433 444 467 378 341 354 372 411
322 289 336 357 290 234 270 308 246 292 349 319 328 242 341 293 143 240 246 249
215 205 276 281 240 287 250 194 237 245 221 233 224 117 220 211 205 254 226 163
122 164 186 223 152 191 171 136 106 178 155 158 146 122 128 127 115 171 137 159
189 109 143 134 155 146 131 160 135 159 189
FAL-A03B 91
398 382 454 473 408 487 447 533 408 437 428 335 426 426 457 389 345 361 383 400
332 288 344 349 292 229 274 288 233 281 346 308 342 245 341 304 130 263 263 248
230 215 277 273 247 291 244 201 241 241 219 227 226 119 205 219 218 250 213 174
142 141 183 222 157 195 170 137 111 186 139 164 148 120 137 118 121 169 142 158
191 100 151 131 154 146 127 170 133 148 238
FAL-A04A 47
594 544 456 352 344 387 433 332 334 272 296 317 395 284 284 259 173 246 211 268
248 197 205 219 161 206 159 223 194 248 166 227 198 178 101 187 196 192 162 145
160 173 157 175 213 218 216
FAL-A04B 47
602 546 455 348 357 331 409 318 343 264 287 315 366 279 280 262 193 225 221 254
231 200 206 243 191 199 164 211 186 245 152 236 199 166 105 192 200 184 168 150
148 166 152 168 217 211 239
FAL-A05A 84
123 241 269 284 355 450 505 464 394 318 339 271 311 346 229 232 206 97 148 147
104 141 111 124 128 80 139 168 85 92 122 112 142 99 94 167 250 244 256 156
164 113 153 158 152 79 103 67 88 56 109 95 82 70 54 56 47 81 112 88
107 100 78 138 88 97 67 80 65 67 79 65 41 54 61 69 56 48 69 74
60 63 58 85
FAL-A05B 84
125 240 268 294 361 452 522 475 397 323 343 277 300 339 236 213 203 98 154 142
119 144 108 119 116 83 125 179 79 95 117 112 133 110 91 170 250 247 252 155
150 112 157 166 150 74 111 72 88 61 107 99 84 75 48 42 57 88 115 71
102 104 76 134 76 93 76 84 61 65 73 59 42 52 58 62 55 50 71 70
61 59 67 75

FAL-A06A 85
533 508 523 572 590 483 477 458 510 518 385 375 336 458 382 296 495 455 338 304
185 243 256 183 260 276 288 314 318 353 334 240 204 322 245 263 326 316 265 150
161 185 246 191 237 240 252 241 221 246 239 189 169 131 168 203 223 196 317 276
217 197 156 305 222 230 235 227 234 180 147 139 136 155 205 193 205 204 166 179
170 139 149 180 178
FAL-A06B 85
478 507 522 562 558 470 499 464 531 505 387 376 348 454 392 306 505 435 334 303
187 235 257 183 273 291 280 295 308 328 351 249 206 316 266 263 317 307 257 161
164 177 240 194 248 254 266 225 224 236 247 201 166 123 172 197 221 201 314 265
217 187 174 297 231 227 248 224 220 185 144 137 128 168 215 180 213 203 166 181
159 152 157 164 185
FAL-A07A 48
315 217 188 225 246 214 276 244 258 294 313 242 240 322 255 286 322 311 340 355
403 387 363 358 320 349 228 191 277 336 336 305 321 354 349 308 280 344 274 295
264 224 239 224 245 221 248 275
FAL-A07B 48
457 230 191 216 238 219 280 261 253 279 332 232 233 330 277 289 301 276 343 363
420 375 363 370 339 356 226 202 278 347 348 308 314 347 349 301 291 334 282 286
272 226 240 218 242 233 274 224
FAL-A08A 86
245 249 265 306 169 112 87 176 260 274 230 227 188 181 111 67 75 60 69 49
48 82 87 142 105 133 151 138 128 118 84 54 34 43 101 103 135 158 207 144
167 115 65 132 123 157 159 138 117 86 108 110 155 148 147 122 141 180 181 151
134 131 90 109 103 88 132 116 95 131 118 101 93 109 114 138 155 173 168 132
110 104 138 180 195 203
FAL-A08B 86
246 249 239 314 184 98 104 168 268 263 227 220 190 190 119 60 71 62 60 50
50 90 79 145 102 121 169 125 137 120 93 51 33 47 91 120 115 162 208 141
168 109 80 126 116 166 161 135 116 77 109 113 146 145 147 109 154 195 179 159
120 136 92 103 98 78 136 121 90 135 109 102 91 113 109 134 157 169 165 133
97 105 142 173 187 209
FAL-A09A 83
121 236 185 310 335 364 272 259 355 262 274 331 296 325 364 374 411 199 295 450
286 248 277 284 286 432 325 322 291 230 194 233 352 326 287 309 279 240 340 214
283 257 195 156 91 135 203 174 174 216 187 155 137 102 81 97 93 108 106 136
111 71 96 83 116 95 136 149 116 142 91 124 81 80 64 87 49 47 84 70
79 80 96
FAL-A09B 83
127 222 168 309 337 362 271 258 364 263 277 354 314 341 361 381 418 189 293 425
284 239 271 280 290 403 316 298 281 199 195 238 357 318 286 312 279 240 336 220
280 248 201 156 83 137 203 170 179 207 191 151 134 99 87 91 91 106 104 126
113 69 99 80 123 103 128 157 117 144 94 130 81 75 63 85 45 62 77 68
78 87 110
FAL-A10A 84
153 177 192 145 206 185 221 228 209 258 327 321 312 307 148 235 185 209 223 218
268 284 176 229 279 215 205 219 223 167 119 112 154 168 183 167 162 140 133 127
109 120 119 90 68 46 52 68 102 75 56 64 45 42 122 150 179 154 138 159
146 122 113 128 119 128 252 241 136 93 73 98 136 135 129 117 105 94 49 65
95 91 72 93
FAL-A10B 84
162 178 193 144 224 197 209 231 217 293 325 320 307 318 165 257 161 208 227 211
266 272 171 224 260 209 211 213 234 167 117 117 145 168 183 166 165 136 133 129
108 121 124 88 69 42 48 76 96 76 53 58 45 42 121 148 169 149 149 142
147 118 108 128 127 114 267 233 132 94 65 102 124 153 133 116 111 93 43 70
94 93 73 83

FAL-A11A 57
386 129 294 372 284 225 291 219 268 127 116 98 69 84 103 176 165 159 149 143
200 252 169 160 117 95 115 99 99 117 194 272 180 237 227 245 257 203 147 150
256 157 225 177 151 142 141 133 85 87 128 117 170 179 133 116 188
FAL-A11B 57
348 161 309 363 291 244 276 226 259 128 121 92 64 88 107 176 155 157 156 143
182 242 145 155 134 91 118 104 96 118 195 274 184 245 252 245 292 231 143 172
255 158 222 168 137 154 153 121 88 95 136 129 154 193 120 117 175
FAL-A12A 47
126 185 113 97 115 235 272 274 307 228 284 282 231 212 237 300 177 225 217 201
211 228 286 387 298 379 482 570 493 414 276 361 364 332 472 428 346 318 378 310
317 352 316 505 394 503 299
FAL-A12B 47
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223 201 296 384 290 366 486 558 519 456 272 361 359 341 466 426 355 311 377 284
319 367 296 534 379 411 328
FAL-A13A 64
266 395 304 153 347 386 342 350 329 236 118 53 80 213 285 258 265 263 197 139
242 253 359 260 116 120 313 219 266 201 250 243 153 167 153 216 200 242 176 146
162 112 85 109 212 196 181 172 148 233 165 107 126 177 199 193 219 201 174 189
199 250 214 209
FAL-A13B 64
260 389 296 144 360 388 340 369 330 229 114 56 86 220 276 268 273 274 198 146
246 249 369 259 124 115 318 207 280 210 247 249 156 177 140 227 208 247 183 137
171 117 90 90 234 196 185 174 146 231 157 114 126 166 204 185 223 213 162 193
198 254 214 192
FAL-A14A 56
435 398 334 405 495 390 320 274 261 292 286 243 179 139 116 70 120 117 187 159
224 226 217 248 235 196 204 163 129 173 225 255 299 199 204 219 220 170 178 336
283 304 243 305 411 262 191 178 242 226 223 236 240 187 165 250
FAL-A14B 56
447 389 336 407 506 343 319 282 274 278 279 225 174 140 122 65 122 118 177 164
244 224 227 238 235 190 202 168 128 165 223 280 297 197 204 214 212 176 172 356
278 311 238 301 414 261 197 177 263 227 230 238 240 169 183 231
FAL-A15A 48
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142 164 135 200 154 250 180 160
FAL-A15B 48
89 66 45 38 41 51 64 69 71 69 78 91 57 54 65 68 84 86 80 71
72 115 157 149 143 140 157 119 191 148 149 238 142 226 213 124 154 164 147 131
159 173 133 201 150 299 154 147
FAL-A16A 55
393 290 226 215 282 318 296 269 353 447 222 158 235 234 303 409 679 458 412 474
361 618 454 535 310 295 260 248 218 281 198 241 373 253 562 396 412 272 240 196
186 240 181 214 225 123 177 201 176 139 128 145 167 186 308
FAL-A16B 55
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171 266 172 224 237 122 155 202 180 154 134 129 168 179 319
FAL-A17A 54
389 359 350 432 373 340 345 417 284 272 314 275 461 414 413 313 298 358 309 413
342 448 382 286 286 313 243 404 326 498 645 394 424 230 216 174 254 152 215 210
226 359 244 286 295 316 293 296 285 379 408 409 461 499
FAL-A17B 54
359 361 305 426 371 330 416 428 291 282 309 265 466 412 403 317 312 370 307 413
346 440 384 284 282 305 250 403 330 503 648 397 420 227 205 175 258 137 225 217
219 361 231 279 277 317 302 318 308 356 418 414 433 639

FAL-A18A 55
113 148 166 219 202 188 132 222 231 172 149 226 465 193 104 115 109 195 179 195
196 220 228 185 227 282 166 165 174 222 219 236 194 180 222 361 354 486 272 273
261 339 320 263 470 342 463 368 223 286 374 298 257 245 254
FAL-A18B 55
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201 220 234 185 219 290 172 146 172 228 190 215 199 166 222 360 338 486 262 261
270 336 312 265 471 324 458 382 213 257 365 308 274 243 346
FAL-A19A 60
126 180 171 233 163 160 262 233 74 78 50 44 84 117 122 165 131 155 132 115
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223 238 196 185 228 192 159 165 161 154 205 241 181 220 150 266 183 198 184 223
FAL-A19B 60
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99 93 125 118 115 136 120 124 154 198 310 261 260 238 219 225 242 196 199 235
204 234 193 189 230 203 167 179 153 166 213 224 214 197 172 243 185 197 200 241
FAL-A20A 57
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123 116 106 108 88 106 64 83 66 77 61 62 103 148 147 167 194 190 122 164
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FAL-A20B 57
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FAL-A21A 61
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295 205 314 185 292 248 322 345 289 376 276 442 356 187 241 292 268 179 231 228
273
FAL-A21B 61
132 171 237 145 135 96 80 135 127 135 103 129 131 91 86 100 199 592 88 79
37 34 79 87 125 156 164 218 187 253 193 196 214 129 150 169 150 198 149 200
304 202 286 194 288 223 316 353 290 377 261 451 349 184 246 298 282 173 243 235
272
FAL-A22A 124
51 84 64 35 39 63 66 61 67 85 63 84 40 32 30 29 35 61 76 79
54 57 59 81 56 75 69 77 55 78 95 72 84 46 55 43 57 64 103 122
119 120 109 137 151 162 119 164 219 245 206 155 113 205 172 179 133 161 168 130
124 133 119 111 104 107 101 98 76 107 104 107 94 93 64 104 122 88 99 76
78 90 87 82 89 76 81 88 96 102 90 93 68 93 75 101 130 95 106 109
83 67 71 94 61 126 113 132 93 96 101 91 76 98 86 109 66 67 59 47
64 38 73 75
FAL-A22B 124
56 90 72 40 36 63 68 53 76 96 65 80 42 28 35 29 40 59 94 88
50 39 37 82 49 74 69 67 51 81 104 78 81 47 70 59 56 73 89 122
116 129 108 128 147 160 138 159 214 244 199 153 125 202 169 180 124 153 185 110
123 130 115 111 109 98 108 101 73 97 105 111 102 93 70 104 117 99 95 74
81 86 82 90 76 83 70 94 102 79 84 87 74 88 81 88 145 85 106 117
78 72 69 85 72 119 117 147 89 97 91 102 83 104 83 110 52 67 58 57
55 37 72 76
FAL-A23A 42
432 448 394 381 314 393 363 319 288 398 361 552 376 309 282 292 258 278 328 226
203 280 247 204 178 230 183 199 225 170 174 211 134 194 200 178 130 143 105 142
183 127
FAL-A23B 42
421 443 386 341 333 381 396 358 246 404 357 507 406 332 231 277 265 269 308 217
244 313 235 199 206 222 198 193 216 176 178 202 132 202 202 178 129 145 113 136
171 116
FAL-A24A 80
277 168 198 351 339 253 202 186 299 273 219 242 253 360 202 240 187 83 138 143
250 188 245 278 235 289 149 141 121 137 171 157 91 82 72 88 111 93 118 74

FAL-A33A 69
364 429 331 229 296 275 251 304 189 186 217 181 131 105 103 150 170 106 122 109
141 115 104 102 148 159 161 183 178 174 175 183 161 222 138 147 81 92 101 95
107 109 96 96 62 94 88 94 93 111 117 106 70 69 78 92 108 112 104 154
124 86 90 99 104 112 117 104 151
FAL-A33B 69
326 421 352 202 318 291 233 309 197 201 215 176 127 106 102 155 158 127 116 102
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111 98 80 88 58 76 79 92 78 100 116 92 85 68 78 95 113 102 99 139
119 82 94 88 106 116 107 94 124
FAL-A34A 43
358 307 216 123 195 239 185 229 240 224 193 142 146 144 154 146 137 153 130 82
109 108 125 83 142 104 101 108 114 122 150 107 92 86 100 120 123 105 119 118
85 78 105
FAL-A34B 43
349 364 268 123 191 239 181 251 235 206 184 152 134 144 157 148 146 150 143 80
107 102 126 90 149 107 105 108 104 128 147 112 89 90 101 116 113 102 125 101
92 74 69
FAL-A35A 66
264 490 219 290 291 143 202 306 173 230 135 220 266 313 288 139 133 103 152 207
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178 216 146 189 167 149 142 89 92 116 216 146 262 240 120 84 107 146 200 187
194 157 154 139 118 117
FAL-A35B 66
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144 195 148 156 95 111 101 181 136 176 199 159 202 186 215 236 130 144 157 174
180 213 153 168 181 152 123 95 87 141 200 149 242 226 122 72 91 142 179 193
167 173 150 119 107 100
FAL-A36A 72
167 97 80 85 101 121 139 112 128 122 64 118 92 83 94 91 66 64 87 72
66 115 80 104 105 68 56 65 183 269 217 219 140 114 153 147 174 139 99 129
119 135 182 231 170 185 223 193 202 268 305 192 209 171 201 243 170 131 162 272
280 241 189 158 144 216 207 232 263 203 207 243
FAL-A36B 72
149 118 79 71 99 104 157 104 128 123 74 110 96 101 70 88 78 58 89 61
65 110 83 101 94 78 64 63 190 266 212 211 131 113 161 145 193 148 91 120
129 141 191 244 160 200 236 176 230 261 297 199 225 177 201 250 168 120 169 256
288 249 197 155 155 193 187 235 237 193 209 213
FAL-A37A 57
492 468 222 295 319 285 207 217 169 206 165 183 182 253 215 141 213 182 238 202
201 161 166 170 162 167 187 145 151 142 155 171 181 137 142 120 133 114 93 183
188 228 189 152 218 154 133 110 123 151 156 199 149 150 120 171 159
FAL-A37B 57
463 465 220 304 300 310 220 219 179 214 177 189 193 253 190 152 205 202 239 213
225 155 163 174 168 164 168 159 121 154 141 178 175 123 138 121 139 114 99 179
196 207 189 149 221 140 131 111 134 145 162 185 175 115 152 140 188
FAL-A38A 66
241 281 285 226 419 408 189 294 297 227 259 182 193 210 157 175 187 222 165 243
190 185 134 130 184 163 131 184 134 123 125 103 107 125 124 59 66 57 59 60
43 56 50 38 49 42 59 43 60 75 47 112 95 53 66 63 85 85 108 101
106 82 100 101 95 96
FAL-A38B 66
223 274 305 216 424 384 190 286 310 225 275 171 184 206 162 173 185 222 164 238
189 190 130 132 189 166 138 173 132 127 128 106 107 129 115 63 64 61 56 57
43 62 48 43 46 43 58 49 59 72 62 109 94 49 62 67 70 103 101 100
103 81 97 103 100 120

69 86 117 92 105 104 78 86 77 92 116 139 93 86 77 51 44 41 52 46
48 46 39 51 33 29 53 66 52 70 68 65 73 69 113 78 71 81 41 52
FAL-A24B 80
281 179 185 348 347 191 193 189 274 282 224 283 232 349 179 249 180 97 112 139
241 203 247 268 231 291 151 150 120 140 162 147 69 80 72 61 107 89 104 76
65 94 112 97 105 96 72 83 91 90 109 144 109 82 87 53 42 34 55 53
43 55 38 45 39 36 39 63 60 81 55 65 73 76 112 81 53 91 43 48
FAL-A25A 57
107 79 60 98 240 357 320 511 395 234 246 267 231 218 154 167 143 82 88 56
45 83 93 126 120 135 138 123 143 96 72 109 109 127 118 118 81 107 130 219
156 250 252 206 171 160 135 178 210 169 223 177 141 142 160 152 123
FAL-A25B 57
161 83 62 102 229 350 332 498 318 218 256 259 237 207 161 166 140 89 77 53
38 91 101 113 130 124 143 124 140 82 75 106 119 123 123 111 86 123 116 226
167 242 246 214 164 173 128 178 201 182 213 182 133 149 168 150 132
FAL-A26A 55
596 676 644 402 391 408 514 416 483 391 409 410 335 376 334 372 325 277 218 296
368 250 349 360 222 175 115 155 190 288 218 239 308 277 234 168 279 229 260 230
262 271 170 222 277 206 178 211 213 153 204 200 191 200 218
FAL-A26B 55
532 641 514 414 456 441 573 502 486 396 391 403 344 371 325 376 313 273 241 299
372 253 358 362 227 166 122 145 197 284 222 232 292 278 248 174 257 236 264 226
271 259 202 213 263 209 179 206 210 164 196 196 208 208 220
FAL-A27A 54
403 393 255 179 190 237 433 284 377 332 293 252 320 233 376 259 258 330 242 288
269 276 229 202 198 153 178 206 248 208 221 249 218 207 181 223 196 272 240 293
312 264 209 221 211 287 259 205 199 156 206 219 151 155
FAL-A27B 54
381 409 268 181 187 263 398 300 383 348 288 250 298 246 362 260 274 308 253 281
268 282 240 189 204 159 173 210 246 203 245 274 203 181 185 222 204 266 225 311
313 264 214 221 208 281 261 210 194 158 200 217 169 167
FAL-A28A 61
143 131 205 267 334 123 301 268 337 391 315 342 297 267 307 374 381 234 332 254
263 217 288 253 318 282 289 293 210 201 251 322 282 281 191 205 211 235 320 339
342 388 234 206 144 295 316 279 279 328 391 347 220 215 329 337 348 370 321 289
189
FAL-A28B 61
130 131 192 269 341 118 314 289 315 403 304 369 309 253 344 343 358 214 340 248
266 216 269 269 321 282 281 299 213 202 263 313 295 281 191 205 215 232 311 347
340 399 231 168 141 286 334 296 282 310 382 332 232 229 297 334 352 311 387 271
235
FAL-A30A 46
308 399 424 340 294 372 409 429 328 344 292 321 335 275 265 317 257 213 226 226
320 422 290 356 409 202 247 169 289 342 340 319 310 416 376 233 275 284 318 310
265 331 261 344 290 337
FAL-A30B 46
373 385 453 303 281 404 398 426 322 366 308 308 316 291 284 315 245 232 224 228
328 412 281 405 397 228 267 172 276 286 332 360 296 430 357 238 246 298 297 308
262 313 303 310 302 331
FAL-A31A 62
175 244 238 266 233 190 136 130 213 219 271 260 330 264 228 178 239 202 205 189
223 202 242 238 190 238 220 154 117 128 134 251 292 223 215 197 168 146 117 131
134 166 123 152 185 164 113 109 182 189 199 158 141 113 97 105 162 109 157 201
185 170
FAL-A31B 62
181 247 249 258 227 193 140 128 220 216 273 261 326 266 224 183 229 203 213 200
232 193 248 238 191 238 215 155 114 132 136 257 290 219 212 196 164 153 110 144
138 164 126 153 170 168 120 105 180 193 197 171 138 122 86 102 170 107 162 194
191 176

Data of measured samples - measurements in 0.01mm units

FAL-A01A 90
288 218 506 333 292 279 372 443 368 357 399 417 372 314 295 419 341 317 211 135
265 283 262 302 214 326 272 304 300 169 83 128 71 183 177 219 205 156 128 124
88 100 139 144 126 172 113 92 86 135 101 157 103 100 88 74 95 134 115 129
152 120 137 106 123 199 194 152 231 151 122 124 149 115 146 150 132 155 132 55
106 167 142 184 182 192 182 160 171 190
FAL-A01B 90
274 302 507 326 306 268 380 463 357 370 382 429 374 331 309 408 347 321 207 140
282 288 260 298 223 318 280 297 302 167 87 125 70 175 181 220 208 161 117 120
97 85 153 136 129 172 115 90 80 131 102 142 109 97 92 67 99 134 119 140
153 121 143 99 121 203 200 149 232 145 133 115 152 126 146 133 152 160 119 70
102 164 148 183 179 190 187 165 175 196
FAL-A02A 84
263 316 269 372 282 267 224 321 301 315 406 223 227 190 143 264 297 298 257 186
193 114 122 166 158 208 189 196 146 176 148 107 127 106 96 109 117 100 66 68
91 143 115 118 133 124 91 111 116 190 139 75 98 79 67 85 93 92 111 84
81 91 123 115 132 118 128 138 107 67 66 60 86 139 114 184 115 102 185 208
130 141 104 122
FAL-A02B 84
296 287 274 364 273 267 220 316 294 299 405 220 228 188 149 252 305 292 262 176
200 110 123 169 162 202 189 191 141 177 149 118 120 115 100 117 101 102 67 78
87 144 110 124 129 118 94 117 118 183 131 78 98 80 69 90 88 87 97 86
79 95 124 116 127 117 139 132 104 61 61 63 90 136 126 165 134 104 180 217
125 136 106 114
FAL-A03A 91
398 391 452 478 393 514 452 529 382 448 424 334 433 444 467 378 341 354 372 411
322 289 336 357 290 234 270 308 246 292 349 319 328 242 341 293 143 240 246 249
215 205 276 281 240 287 250 194 237 245 221 233 224 117 220 211 205 254 226 163
122 164 186 223 152 191 171 136 106 178 155 158 146 122 128 127 115 171 137 159
189 109 143 134 155 146 131 160 135 159 189
FAL-A03B 91
398 382 454 473 408 487 447 533 408 437 428 335 426 426 457 389 345 361 383 400
332 288 344 349 292 229 274 288 233 281 346 308 342 245 341 304 130 263 263 248
230 215 277 273 247 291 244 201 241 241 219 227 226 119 205 219 218 250 213 174
142 141 183 222 157 195 170 137 111 186 139 164 148 120 137 118 121 169 142 158
191 100 151 131 154 146 127 170 133 148 238
FAL-A04A 47
594 544 456 352 344 387 433 332 334 272 296 317 395 284 284 259 173 246 211 268
248 197 205 219 161 206 159 223 194 248 166 227 198 178 101 187 196 192 162 145
160 173 157 175 213 218 216
FAL-A04B 47
602 546 455 348 357 331 409 318 343 264 287 315 366 279 280 262 193 225 221 254
231 200 206 243 191 199 164 211 186 245 152 236 199 166 105 192 200 184 168 150
148 166 152 168 217 211 239
FAL-A05A 84
123 241 269 284 355 450 505 464 394 318 339 271 311 346 229 232 206 97 148 147
104 141 111 124 128 80 139 168 85 92 122 112 142 99 94 167 250 244 256 156
164 113 153 158 152 79 103 67 88 56 109 95 82 70 54 56 47 81 112 88
107 100 78 138 88 97 67 80 65 67 79 65 41 54 61 69 56 48 69 74
60 63 58 85
FAL-A05B 84
125 240 268 294 361 452 522 475 397 323 343 277 300 339 236 213 203 98 154 142
119 144 108 119 116 83 125 179 79 95 117 112 133 110 91 170 250 247 252 155
150 112 157 166 150 74 111 72 88 61 107 99 84 75 48 42 57 88 115 71
102 104 76 134 76 93 76 84 61 65 73 59 42 52 58 62 55 50 71 70
61 59 67 75

FAL-A06A 85
533 508 523 572 590 483 477 458 510 518 385 375 336 458 382 296 495 455 338 304
185 243 256 183 260 276 288 314 318 353 334 240 204 322 245 263 326 316 265 150
161 185 246 191 237 240 252 241 221 246 239 189 169 131 168 203 223 196 317 276
217 197 156 305 222 230 235 227 234 180 147 139 136 155 205 193 205 204 166 179
170 139 149 180 178
FAL-A06B 85
478 507 522 562 558 470 499 464 531 505 387 376 348 454 392 306 505 435 334 303
187 235 257 183 273 291 280 295 308 328 351 249 206 316 266 263 317 307 257 161
164 177 240 194 248 254 266 225 224 236 247 201 166 123 172 197 221 201 314 265
217 187 174 297 231 227 248 224 220 185 144 137 128 168 215 180 213 203 166 181
159 152 157 164 185
FAL-A07A 48
315 217 188 225 246 214 276 244 258 294 313 242 240 322 255 286 322 311 340 355
403 387 363 358 320 349 228 191 277 336 336 305 321 354 349 308 280 344 274 295
264 224 239 224 245 221 248 275
FAL-A07B 48
457 230 191 216 238 219 280 261 253 279 332 232 233 330 277 289 301 276 343 363
420 375 363 370 339 356 226 202 278 347 348 308 314 347 349 301 291 334 282 286
272 226 240 218 242 233 274 224
FAL-A08A 86
245 249 265 306 169 112 87 176 260 274 230 227 188 181 111 67 75 60 69 49
48 82 87 142 105 133 151 138 128 118 84 54 34 43 101 103 135 158 207 144
167 115 65 132 123 157 159 138 117 86 108 110 155 148 147 122 141 180 181 151
134 131 90 109 103 88 132 116 95 131 118 101 93 109 114 138 155 173 168 132
110 104 138 180 195 203
FAL-A08B 86
246 249 239 314 184 98 104 168 268 263 227 220 190 190 119 60 71 62 60 50
50 90 79 145 102 121 169 125 137 120 93 51 33 47 91 120 115 162 208 141
168 109 80 126 116 166 161 135 116 77 109 113 146 145 147 109 154 195 179 159
120 136 92 103 98 78 136 121 90 135 109 102 91 113 109 134 157 169 165 133
97 105 142 173 187 209
FAL-A09A 83
121 236 185 310 335 364 272 259 355 262 274 331 296 325 364 374 411 199 295 450
286 248 277 284 286 432 325 322 291 230 194 233 352 326 287 309 279 240 340 214
283 257 195 156 91 135 203 174 174 216 187 155 137 102 81 97 93 108 106 136
111 71 96 83 116 95 136 149 116 142 91 124 81 80 64 87 49 47 84 70
79 80 96
FAL-A09B 83
127 222 168 309 337 362 271 258 364 263 277 354 314 341 361 381 418 189 293 425
284 239 271 280 290 403 316 298 281 199 195 238 357 318 286 312 279 240 336 220
280 248 201 156 83 137 203 170 179 207 191 151 134 99 87 91 91 106 104 126
113 69 99 80 123 103 128 157 117 144 94 130 81 75 63 85 45 62 77 68
78 87 110
FAL-A10A 84
153 177 192 145 206 185 221 228 209 258 327 321 312 307 148 235 185 209 223 218
268 284 176 229 279 215 205 219 223 167 119 112 154 168 183 167 162 140 133 127
109 120 119 90 68 46 52 68 102 75 56 64 45 42 122 150 179 154 138 159
146 122 113 128 119 128 252 241 136 93 73 98 136 135 129 117 105 94 49 65
95 91 72 93
FAL-A10B 84
162 178 193 144 224 197 209 231 217 293 325 320 307 318 165 257 161 208 227 211
266 272 171 224 260 209 211 213 234 167 117 117 145 168 183 166 165 136 133 129
108 121 124 88 69 42 48 76 96 76 53 58 45 42 121 148 169 149 149 142
147 118 108 128 127 114 267 233 132 94 65 102 124 153 133 116 111 93 43 70
94 93 73 83

FAL-A11A 57
386 129 294 372 284 225 291 219 268 127 116 98 69 84 103 176 165 159 149 143
200 252 169 160 117 95 115 99 99 117 194 272 180 237 227 245 257 203 147 150
256 157 225 177 151 142 141 133 85 87 128 117 170 179 133 116 188
FAL-A11B 57
348 161 309 363 291 244 276 226 259 128 121 92 64 88 107 176 155 157 156 143
182 242 145 155 134 91 118 104 96 118 195 274 184 245 252 245 292 231 143 172
255 158 222 168 137 154 153 121 88 95 136 129 154 193 120 117 175
FAL-A12A 47
126 185 113 97 115 235 272 274 307 228 284 282 231 212 237 300 177 225 217 201
211 228 286 387 298 379 482 570 493 414 276 361 364 332 472 428 346 318 378 310
317 352 316 505 394 503 299
FAL-A12B 47
123 187 116 94 113 264 284 267 316 234 232 278 248 188 216 271 179 236 206 226
223 201 296 384 290 366 486 558 519 456 272 361 359 341 466 426 355 311 377 284
319 367 296 534 379 411 328
FAL-A13A 64
266 395 304 153 347 386 342 350 329 236 118 53 80 213 285 258 265 263 197 139
242 253 359 260 116 120 313 219 266 201 250 243 153 167 153 216 200 242 176 146
162 112 85 109 212 196 181 172 148 233 165 107 126 177 199 193 219 201 174 189
199 250 214 209
FAL-A13B 64
260 389 296 144 360 388 340 369 330 229 114 56 86 220 276 268 273 274 198 146
246 249 369 259 124 115 318 207 280 210 247 249 156 177 140 227 208 247 183 137
171 117 90 90 234 196 185 174 146 231 157 114 126 166 204 185 223 213 162 193
198 254 214 192
FAL-A14A 56
435 398 334 405 495 390 320 274 261 292 286 243 179 139 116 70 120 117 187 159
224 226 217 248 235 196 204 163 129 173 225 255 299 199 204 219 220 170 178 336
283 304 243 305 411 262 191 178 242 226 223 236 240 187 165 250
FAL-A14B 56
447 389 336 407 506 343 319 282 274 278 279 225 174 140 122 65 122 118 177 164
244 224 227 238 235 190 202 168 128 165 223 280 297 197 204 214 212 176 172 356
278 311 238 301 414 261 197 177 263 227 230 238 240 169 183 231
FAL-A15A 48
91 67 50 33 38 51 67 71 70 71 79 108 52 51 66 72 70 88 66 62
77 96 151 157 140 140 164 106 194 144 156 239 144 214 210 127 147 162 177 133
142 164 135 200 154 250 180 160
FAL-A15B 48
89 66 45 38 41 51 64 69 71 69 78 91 57 54 65 68 84 86 80 71
72 115 157 149 143 140 157 119 191 148 149 238 142 226 213 124 154 164 147 131
159 173 133 201 150 299 154 147
FAL-A16A 55
393 290 226 215 282 318 296 269 353 447 222 158 235 234 303 409 679 458 412 474
361 618 454 535 310 295 260 248 218 281 198 241 373 253 562 396 412 272 240 196
186 240 181 214 225 123 177 201 176 139 128 145 167 186 308
FAL-A16B 55
404 267 205 206 279 314 303 274 356 447 225 167 217 241 309 438 638 421 395 476
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171 266 172 224 237 122 155 202 180 154 134 129 168 179 319
FAL-A17A 54
389 359 350 432 373 340 345 417 284 272 314 275 461 414 413 313 298 358 309 413
342 448 382 286 286 313 243 404 326 498 645 394 424 230 216 174 254 152 215 210
226 359 244 286 295 316 293 296 285 379 408 409 461 499
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FAL-A18A 55
113 148 166 219 202 188 132 222 231 172 149 226 465 193 104 115 109 195 179 195
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261 339 320 263 470 342 463 368 223 286 374 298 257 245 254
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146 132 157 215 189 167 116 227 238 159 149 228 460 192 110 119 122 179 190 190
201 220 234 185 219 290 172 146 172 228 190 215 199 166 222 360 338 486 262 261
270 336 312 265 471 324 458 382 213 257 365 308 274 243 346
FAL-A19A 60
126 180 171 233 163 160 262 233 74 78 50 44 84 117 122 165 131 155 132 115
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223 238 196 185 228 192 159 165 161 154 205 241 181 220 150 266 183 198 184 223
FAL-A19B 60
109 161 164 227 174 179 283 242 75 77 62 42 85 115 154 165 116 152 135 123
99 93 125 118 115 136 120 124 154 198 310 261 260 238 219 225 242 196 199 235
204 234 193 189 230 203 167 179 153 166 213 224 214 197 172 243 185 197 200 241
FAL-A20A 57
360 450 322 367 417 445 365 369 359 282 292 100 85 58 32 60 52 83 97 107
123 116 106 108 88 106 64 83 66 77 61 62 103 148 147 167 194 190 122 164
170 187 291 221 406 302 239 204 193 144 159 176 169 195 240 416 353
FAL-A20B 57
329 484 348 352 416 427 376 344 350 260 306 107 89 53 36 51 57 76 100 106
124 122 110 102 90 101 71 87 62 72 62 71 98 155 132 171 171 196 143 176
158 184 290 223 398 314 234 204 185 159 164 173 187 202 252 417 320
FAL-A21A 61
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FAL-A21B 61
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FAL-A22A 124
51 84 64 35 39 63 66 61 67 85 63 84 40 32 30 29 35 61 76 79
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FAL-A22B 124
56 90 72 40 36 63 68 53 76 96 65 80 42 28 35 29 40 59 94 88
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81 86 82 90 76 83 70 94 102 79 84 87 74 88 81 88 145 85 106 117
78 72 69 85 72 119 117 147 89 97 91 102 83 104 83 110 52 67 58 57
55 37 72 76
FAL-A23A 42
432 448 394 381 314 393 363 319 288 398 361 552 376 309 282 292 258 278 328 226
203 280 247 204 178 230 183 199 225 170 174 211 134 194 200 178 130 143 105 142
183 127
FAL-A23B 42
421 443 386 341 333 381 396 358 246 404 357 507 406 332 231 277 265 269 308 217
244 313 235 199 206 222 198 193 216 176 178 202 132 202 202 178 129 145 113 136
171 116
FAL-A24A 80
277 168 198 351 339 253 202 186 299 273 219 242 253 360 202 240 187 83 138 143
250 188 245 278 235 289 149 141 121 137 171 157 91 82 72 88 111 93 118 74

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FAL-A24B 80
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241 203 247 268 231 291 151 150 120 140 162 147 69 80 72 61 107 89 104 76
65 94 112 97 105 96 72 83 91 90 109 144 109 82 87 53 42 34 55 53
43 55 38 45 39 36 39 63 60 81 55 65 73 76 112 81 53 91 43 48
FAL-A25A 57
107 79 60 98 240 357 320 511 395 234 246 267 231 218 154 167 143 82 88 56
45 83 93 126 120 135 138 123 143 96 72 109 109 127 118 118 81 107 130 219
156 250 252 206 171 160 135 178 210 169 223 177 141 142 160 152 123
FAL-A25B 57
161 83 62 102 229 350 332 498 318 218 256 259 237 207 161 166 140 89 77 53
38 91 101 113 130 124 143 124 140 82 75 106 119 123 123 111 86 123 116 226
167 242 246 214 164 173 128 178 201 182 213 182 133 149 168 150 132
FAL-A26A 55
596 676 644 402 391 408 514 416 483 391 409 410 335 376 334 372 325 277 218 296
368 250 349 360 222 175 115 155 190 288 218 239 308 277 234 168 279 229 260 230
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FAL-A26B 55
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FAL-A28A 61
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262 313 303 310 302 331
FAL-A31A 62
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FAL-A33A 69
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FAL-A34A 43
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