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THE FABRICATION OF TARGET ELEMENTS FOR THE HIGH-FLUX ISOTOPE REACTOR

J. D. Sease

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J. D. Sease

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Oak Ridge, Tennessee
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THE FABRICATION OF TARGET ELEMENTS FOR THE HIGH-FLUX ISOTOPE REACTOR

J. D. Sease

ABSTRACT

Thirty-seven High-Flux Isotope Reactor target elements, 31 of which will comprise the first High-Flux Isotope Reactor target assembly, were fabricated. The 3/8-in.-diam aluminum-clad elements each contain 8 g of ^{242}Pu in the form of 35 aluminum-jacketed pellets of PuO_2 dispersed in aluminum and pressed to 90% of theoretical density. The pellets were sealed by welding in a helium-filled finned aluminum tube, which was then canned in a cylindrical aluminum sheath. In addition, 38 simulated High-Flux Isotope Reactor elements that contain 10% enriched UO_2 and tantalum to match the heat generation and cross section of the ^{242}Pu target elements and 19 High-Flux Isotope Reactor target elements that each contain 10 g ^{242}Pu for irradiation at Savannah River Laboratory were fabricated. The design and fabrication of these elements are described along with results of examination of the completed elements, including photographs, radiographs, and complete dimensional data. In the description of the fabrication procedure two developments of major significance are discussed. One is the development of a blending-dispensing technique for the $\text{PuO}_2\text{-Al}$ core mixture. The second is a unique welding joint design and welding procedure that minimizes the "blowout" problem in closure welds on the 3/8-in.-diam thick-walled aluminum target tubes.

INTRODUCTION

Targets containing various transuranium elements will be irradiated in the flux trap of the High-Flux Isotope Reactor to produce research quantities of such transplutonic elements as americium, curium, and californium. These 3/8-in.-diam aluminum-clad target elements, which will contain suitable actinide oxide target materials, will be subjected to thermal neutron fluxes in excess of 3×10^{15} neutron $\text{cm}^{-2} \text{sec}^{-1}$ and must be capable of dissipating large quantities of heat and withstanding cyclic operations over their 18-month residence in the reactor. In order

to evaluate the design of the target elements, we fabricated¹ and irradiated a series of prototype irradiation target elements. The results of the irradiation tests have been completely satisfactory,^{2,3} and in addition, six elements of similar design have been irradiated at Savannah River Laboratory for approximately 18 months without incidence.⁴ The first target assembly for the HFIR will contain 31 ^{242}Pu -containing elements. This report covers the fabrication and pertinent preirradiation data of 37 ^{242}Pu -containing target elements that will be used for the first HFIR target irradiations, 39 UO_2 -Ta-containing simulated target elements for initial startup experiments of the HFIR, and 18 additional ^{242}Pu -containing target elements that were fabricated earlier for irradiation at SRL. The 18 SRL elements, which were fabricated so that the production of significant quantities of the transplutonic elements could be begun at an earlier date than the operation of the HFIR, were made in the HFIR target element configuration so that the elements could be irradiated in the HFIR at a later date. The configuration of all of these elements was identical except for the loadings. Each target element for the first HFIR target assembly contained 8 g of PuO_2 . The elements for SRL each contained 10 g of PuO_2 , and the simulated elements each contained 10.71 g Ta and 2.95 g of 10% enriched UO_2 . The loading of the first HFIR targets was dictated primarily by heat generation considerations and by the available ^{242}Pu . Initial calculations on the production of transplutronics in the HFIR indicate that the production of californium is somewhat insensitive to the loading because of various perturbations in the neutron flux. From a production consideration, the loading of the first HFIR target elements could have varied from 7 to 10 g of ^{242}Pu . The loading of the simulated targets was established to match the heat generation and

¹J. D. Sease and D. M. Hewette II, Fabrication and Preirradiation Data for High Flux Isotope Reactor Prototype Target Rods, ORNL-TM-811 (June 1964).

²A. R. Olsen et al., "Irradiation of Target Prototypes," Transuranium Quart. Progr. Rept. Aug. 31, 1964, ORNL-3739, pp. 49-52.

³A. R. Olsen et al., "Irradiation of Target Prototypes," Transuranium Quart. Progr. Rept. Nov. 30, 1964, ORNL-3847, p. 42.

⁴J. D. Sease, Fabrication and Preirradiation Data of HFIR Target Elements for Savannah River Irradiations, ORNL-TM-1095 (June 1965).

cross section of the ^{242}Pu target elements. The loading of the SRL target elements was established primarily by the transplutonic production considerations and by the availability of the ^{242}Pu .

ELEMENT DESIGN

The configuration of the HFIR target element is shown in Fig. 1 and detailed engineering drawings are included in Appendix A. As indicated in the drawing, a 20-in. active column is composed of 35 separate pressed aluminum-jacketed pellets, which are nominally 0.250-in. OD by 0.571-in. long containing the $^{242}\text{PuO}_2$, or in the case of the simulated elements, $\text{UO}_2\text{-Ta}$ dispersed in pure aluminum. The aluminum jacket consists of an open-end aluminum tube having a nominal wall thickness of 0.025 in. with 0.050-in.-thick pressed aluminum powder cap on each end. The jacket is provided to minimize spread of contamination during fabrication. The core of the pellets, which contains the plutonium oxide particles in the

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Fig. 1. Configuration of HFIR Target Element.

aluminum matrix, was pressed to a nominal of 90% of theoretical density. This density was established to allow room for fission-product expansion.

The aluminum target tube has discontinuous fins that position the tube inside the cover can. The hex portion on the cover can positions the target elements within the target assembly. The arrangement of the target elements within the HFIR target assembly is shown in Fig. 2. The plenums, which are lined with 7075-T6 aluminum sleeves to support the tube during the collapse step in fabrication, are to collect fission gases. The fusion-welded end closures were made using the inert-gas tungsten-arc process. The cover can was attached to the target tube by a mechanical staking process.

Fig. 2. Position of Elements in HFIR Target Assembly.

MATERIALS

The coarse high-density PuO_2 was prepared by the procedure outlined in Appendix B. The prepared PuO_2 was near stoichiometric with the isotopic content of plutonium being 96% ^{242}Pu . The nominal particle size distribution of the PuO_2 used in the HFIR target elements is shown in Table 1.

Table 1. Particle Size Distribution of $^{242}\text{PuO}_2$

Screen Size (U.S. Standard Mesh)	Particle Size (μ)	PuO_2 (wt %)
-70 +100	210-149	48.0
-100 +200	149-74	23.6
-200 +325	74-44	11.0
-325	<44	17.4

The PuO_2 particle size distribution for the SRL elements was essentially identical except the -325 fraction was omitted from those elements. The UO_2 used in the simulated element was arc-fused UO_2 prepared by the Spencer Chemical Company. The detailed analysis and isotopic content of this material is included in Appendix C. The particle size of UO_2 used was -200 +325 mesh made by crushing large chunks of the fused material. The tantalum used was essentially 99.9% pure tantalum powder having a particle size distribution of 75% -200 +325 mesh, 25% of -325 mesh. The detailed analysis of the tantalum powder is also included in Appendix C.

The aluminum powder used was type 1100 semispheroidal (Alcoa grade 101-99.75% Al, 0.25% Si + Fe, maximum) that had been vacuum annealed (less than 50 μ) for 2 hr at 550°C. The aluminum powder used in the core was -100 mesh powder which contained approximately 80% of -325 mesh material and had a mean particle size of near 20 μ . The end cap powder was -270 +325 mesh type 1100 aluminum. The pellet jackets were prepared from fully annealed type 1100 aluminum tubing stock 0.249 in. OD by 0.219 in. ID by (0.900 $\pm$ 0.002) in. long. The finned X-8001 aluminum cladding tubing was prepared by extruding a continuous finned tube and then by machining the fins from the intermediate areas. The cover can was also made from X-8001 stock. The cans were prepared

by first extruding a hex tube and then forming the round portion of the can by a drawing operation. The final configuration of the hex area was then prepared by machining.

FABRICATION PROCEDURE

The various steps in the fabrication process are shown schematically in Fig. 3. All operations involving direct contact with plutonium oxide were carried out in alpha-tight gloved enclosures. The operations

Fig. 3. Flow Diagram for Fabricating Plutonium Target Elements.

involving contact with UO_2 were carried out in an open-faced ventilated hood. The final fabrication and inspection steps, with the exception of radiography, were on benches inside a contamination controlled area. Radiography was carried out in a regulated zone.

Pellet Fabrication

The plutonium oxide pellets were prepared in the batch and pellet weighing box (Fig. 4), the pellet pressing glove box (Fig. 5), and the thermal cleaning glove box (Fig. 6). The three glove boxes are interconnected through ports to facilitate handling.

Photo 81696

Fig. 4. Batch and Pellet Weighing Box.

Fig. 5. Glove Box for Pressing Pellets.

Fig. 6. Glove Box for Thermal Cleaning.

Weighing and Blending

Aluminum and plutonium oxide powders are weighed out in batch quantities sufficient to produce the 35 pellets needed for one element, plus three to five spares. In weighing out plutonium oxide-containing batches, we normally allowed for three spares with two additional spares allowed on the first batch to adjust the pressing conditions. In fabricating the pellets for the SRL elements, we experienced considerable difficulty in obtaining the 35 acceptable pellets out of a 38-pellet batch. Therefore, the majority of batches for these elements allowed as many as five rejects. In the case of the simulated pellets, we allowed five rejects per batch, mainly because the materials involved were not expensive. The nominal pellet compositions that were used in the calculation of batch compositions are shown in Table 2. The detailed calculations of the various pellet loadings are included in Appendix D.

Table 2. Theoretical Pellet Core Compositions

Type Target	Aluminum (g)	PuO ₂ (g)	UO ₂ (g)	Tantalum (g)
HFIR	0.534	0.259		
Simulated	0.524		0.084	0.306
SRL	0.519	0.324		

In the fabrication of the pellets for both the simulated and first HFIR target assembly elements, we used a newly developed system for blending, dispensing, and weighing, instead of the system that was used in previous fabrication and in the fabrication of the pellets for the 18 HFIR target elements for SRL. The setup of equipment and the procedure used in making pellets for the 18 SRL elements are covered thoroughly in the report on the fabrication of the first group of target elements for SRL irradiations.⁵ Figure 4 shows the new system for blending, dispensing, and weighing in the plutonium oxide glove box line. The

⁵J. D. Sease, Fabrication and Preirradiation Data of HFIR Target Elements for Savannah River Irradiations, ORNL-TM-1095 (June 1965).

apparatus consists of a small double-coned type blender with an internal valve, a natural frequency feeder for dispensing the powders from the blending container, and a top loading milligram balance. In fabricating the simulated and first HFIR target pellets, after batch weighing and introducing the core powders into the blending container, the powders were blended for a minimum of 2 hr by rotating the blender end-over-end at approximately 20 rpm. After blending, the blending container was carefully positioned over the vibratory feeding trough, and the valve was opened. The blending container served as a hopper for the blended powders. The blender container mouth was positioned approximately 1/16 in. from the bottom of a feeder trough to establish a powder bed that could be easily controlled. To prevent segregation of the powders, it is extremely important to completely isolate the hopper from the feeder. Each pellet was weighed out on the top-loading milligram balance in two steps. (1) A die containing the pellet liner and a prepressed bottom cap were placed on the balance pan and the core powder introduced by the vibratory feeder. The core powder was then slightly prepressed by a manually operated tamp rod. (2) The top cap powder was then added with a vibratory spatula. The top pan balance has a sensitivity of 0.5 mg and a readability of 1 mg. A manual cutoff of the powder was used for all weighings. In general, we dispensed the core powders within 5 mg and the caps within 1 to 2 mg.

Pressing

Individual dies (drill bushing) were used for each pellet within a batch; two sets of dies were used alternately to press the pellets of a particular composition. Before being loaded, the dies were lubricated with a saturated solution of stearic acid in acetone to reduce die-wall friction during pressing. The pellets were pressed at a constant pressure on a hydraulically actuated 10-ton press. An electrically driven hydraulic pump that allowed rapid and continuous application of pressure during pressing was used. During the pressing of the first pellet batch, the pressure was adjusted to obtain the 0.571 in. nominal length. The pressing pressure thus established and used throughout the pellet pressing operations was approximately 30 tsi. The 35 pellets to

be used in the elements were selected after pressing. The pellets were rejected if a length deviation indicated an excess or deficiency of plutonium oxide or if the surface showed defects. From operational irradiation hot-spot calculations, we were allowed approximately ± 24 wt % variation of the plutonium oxide loading from pellet-to-pellet and within a pellet. Normally, we do not mix pellets from batch-to-batch; but, in the fabrication of the SRL pellets, because of a large number of rejects, we were forced to mix pellet batches.

Cleaning

After being pressed, the pellets were thermally cleaned to remove the adhering die lubricant and any aluminum hydride that may have formed on the aluminum powder when it was handled in air. In this treatment the pellets were heated in a vacuum (less than 50μ) to 550°C and held at this temperature for 3 hr.

ELEMENT ASSEMBLY

Rod Loading

The 35 acceptable pellets for each element were loaded one at a time into prefabricated tubes. Each tube had one welded and fully inspected end closure (see next section) and included the bottom support sleeve. To minimize contamination of the outside surfaces during loading, we covered the entire tube, with the exception of the open end, with aluminum foil and plastic sheet. After completion of loading, the pellets were seated with a ramrod, the top plenum was measured, and the support liner was cut to length and placed in the tube. The loaded tubes were then transferred to the welding glove box, where the aluminum foil and the plastic were removed.

End-Cap Welding

The end closures were welded in the welding glove box shown in Fig. 7. Before assembly the end plugs and mating parts were thoroughly

Fig. 7. Welding Glove Box

degreased with acetone and wire brushed. When an element was set up for end-cap welding, the tube was first evacuated and backfilled with helium, the end cap was inserted, and the tube was joined mechanically to the end cap by roll bonding the tube onto the cap at a groove premachined in the tube. A reduction of 0.010 in. on the radius of the tube groove made an effective leak-tight seal.

The fusion welds were made with the gas tungsten-arc process. A unique weld joint design, which included filler metal as an integral portion of the machined joint hardware, was employed. Figure 8 shows the weld joint (a) as-assembled and (b) after roll bonding. A standard gas tungsten-arc welding torch and a Miller model ESR-150 constant-current programmed direct-current welding power supply were used.

In making the first welds we found that the number of rejects could be reduced by welding with a reduced tube internal pressure. The first closure weld on each tube was made with approximately 0.5-atm internal pressure, achieved simply by pumping the tube down through an attached rubber hose with a mechanical vacuum pump and then clamping the hose.

Fig. 8. Weld Joint. (a) As-assembled. (b) After roll bonding.

To prepare for welding in the welding fixture, the element was first inserted into an aluminum collet, which served both as a gripping device for holding the rod during welding and as a heat sink. Then the electrode spacing between the tungsten tip and the tube was set at 0.028 in. The final arrangement of the element in the fixture is shown schematically in Fig. 9. Rotation of the welding fixture was then begun and the automatic welding sequence, shown in Fig. 10, was initiated. Also, shown in Fig. 10 are the stages in welding superimposed on the weld cycle. The welding voltage, as recorded during the welding portion of the cycle, was approximately 18 v.

The welding procedure used on the final closures differed from that on the first closures only in the method by which the internal gas pressure was reduced before welding. After roll-swaging and immediately before welding, the opposite end of the tube was submerged in liquid

Fig. 9. Welding Setup Showing Position of Welding Torch in (a) Front and (b) Sectional Views.

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Fig. 10. Typical Weld Cycle Showing Sequence of Events During Welding.

nitrogen to reduce the internal gas pressure. The major problem in closure welding, particularly of small-diameter tubing, had been "blowout" (large void areas at the root of the weld) caused by the expansion of gases inside the tube during welding. The use of the swaged end-cap design and the liquid nitrogen bath essentially eliminated this troublesome problem.

The sealed tubes were cleaned and checked for transferable contamination, removed from the welding glove box, monitored for alpha, beta, and gamma activity, and checked for leak tightness. The limits of transferable activity established for the HFIR targets were

α -Pu - 4.8×10^3 dis/min per 100 cm² - β -Pu - 5×10^5 dis/min per 100 cm².

The entire rod was checked for leaks by placing it in a vacuum chamber connected to a helium mass spectrometer leak detector having a calibrated sensitivity of 5×10^{-10} std cm³/sec. Any detectable leak in the chamber was grounds for rejection. After leak testing, the weld areas were radiographed using soft x-ray techniques. At this point precollapse dimensional data and photographs were taken.

Collapse

To improve the heat transfer between the pellet column and the cladding, the cladding was collapsed by a 5-min application of hydrostatic pressure at 20,000 psi. With this procedure an 0.0005-in. radial gap is expected. After collapse, bow introduced by the collapse step was removed by hand straightening. Then the welds were leak tested, the closure welds and the target rod were radiographed, the dimensions were measured, and the rod was photographed.

Cover-Can Attachment

The target rod sheath was slid over the finned target tube and then attached at two places along each of the bottom fins (long set of 6 fins) by deforming the can into the extremities of the fins on the target tube by a punching operation. This operation, which was carried out in the

fixture designed for operation in the TRU Facility,⁶ forms a mechanical joint that has a tensile strength in the order of 200 lb. The sheath was attached at only one end to allow for differential thermal expansion of the can and tube.

After the sheath was attached, the rod-to-sheath spacing and bow were measured and the final photographs taken. The rod-to-sheath spacing was measured with a "Dermation" eddy-current probe.⁶ To measure bow, we rotated the rod while it was suspended horizontally between two V-blocks and measured the runout with a dial indicator. The diameter was measured with flat-faced micrometers.

FABRICATION RESULTS AND DATA

Pellets

The distribution of plutonium oxide or uranium oxide from pellet-to-pellet and within a pellet was the major concern in fabrication of the pellets because of the heat that will be generated in the oxide particles during irradiation. The blending of the plutonium oxide and aluminum core powders is difficult because of the large difference in the sizes and densities of the materials involved. The plutonium oxide powder had a density of 11.47 g/cm³ with a mean particle size in the order of 150 μ while the aluminum powder had a density of 2.7 g/cm³ with a mean particle size of near 20 μ . The blending of these powders is analogous to mixing lead basketballs with glass marbles. The large difference in density, however, does make it possible to semiquantitatively determine the pellet-to-pellet oxide concentration from the pressed pellet length variation, if the pellet weight, pressing pressure, and die-wall friction are held constant.

In the pressed pellet, we know the weight and volume of the aluminum plus the plutonium oxide; and by using the densities of the aluminum and plutonium oxide, we can derive a formula for the weight of plutonium

⁶M. K. Preston et al., "Development of Equipment for Fabricating Targets in the TRU Facility," Transuranium Quart. Progr. Rept. Nov. 30, 1964, ORNL-3580, p. 40.

oxide as a function of the pellet length. The formulas for the plutonium oxide concentration as a function of pellet length for the HFIR and SRL pellets derived in this manner are as follows:

$$(1) \text{ HPx} = 1.647 - 2.43 (\text{Lx})$$

$$(2) \text{ SPx} = 1.768 - 2.53 (\text{Lx})$$

$$(3) \text{ Lx} = (\text{PL} - \overline{\text{PL}}) + 0.571$$

where

HPx and SPx = plutonium oxide loading in grams for the HFIR and SRL pellets of ideal weight, respectively;

PL = the pellet length in inches;

$\overline{\text{PL}}$ = the average pellet length of the batch of pellets from which PL is taken expressed in inches; and

0.571 = the ideal average pellet length.

Normally, variations in pressing pressure and die-wall friction account for length variations of less than ± 0.002 in. However, if die lubrication is not carried out properly, die-wall friction can cause length variations in excess of ± 0.020 in. To determine the overall quality of batch blending, weight variations can be normalized to the ideal weight by applying a correction factor of ± 0.001 in. for every 0.003-g pellet weight variation from the ideal pellet weight.

A summary of the pellet fabrication data is shown in Table 3. The fabrication data on each pellet batch are included in Appendix E. The data in Table 3 reflect all the pellets fabricated within a batch except for the pellets discounted where there was an obvious operator error, such as the addition of two top caps. Summary of the pellet fabrication data of the pellets used in the target elements is shown in Table 4.

The pellet's length was our major rejection criterion and was also an excellent indication of blending efficiency. In Tables 3 and 4 there is a marked difference in the standard deviation of the SRL pellet length compared to the value for HFIR or simulated pellets. The SRL pellets did have a slightly higher plutonium oxide loading; however, the difference in length variation is much greater than can possibly be attributed to this loading difference. These data certainly attest to the superiority of the newly developed blending-dispensing system over the previous system.

Table 3. Average Pellet Data for all Pellets Fabricated

Pellet Description	Type of Element		
	HFIR	Simulated	SRL
Number of pellet batches	42	40	18
Pellet weight, g	1.353	1.474	1.406
Weight standard deviation, g	0.005	0.004	0.006
Length, in.	0.571	0.569	0.569
Length standard deviation, in.	0.003	0.003	0.012
Maximum pellet length, in.	0.579	0.577	0.600
Minimum pellet length, in.	0.564	0.563	0.542

Table 4. Average Pellet Data for Pellets Used in Target Elements

Pellet Description	Type of Element		
	HFIR	Simulated	SRL
Number of elements	37	38	18
Pellet weight, g	1.353	1.475	1.407
Weight standard deviation, g	0.003	0.003	0.004
Length, in.	0.570	0.569	0.569
Length standard deviation, in.	0.003	0.002	0.009

The major segregation problem within a pellet is caused by the separation of blended Al-PuO₂ powders when the mix is dropped into the die. The large and heavy plutonium oxide particles have a tendency to sift through the light aluminum particles because of the difference in the inertia of the particles imparted by the drop into the die. To minimize segregation within pellets, the free-fall drop of the blended powder into the die was minimized and slow feeding was used to ensure that only a small number of particles were in free-fall at a given time. After loading, segregation of the powders within a die can be caused by a sudden jar; therefore, after dispensing, the dies were handled cautiously. Figure 11 is a typical cross section of a Ta-UO₂ simulated pellet and shows typical dispersion of oxide with a pellet. The dark spots are the tantalum and UO₂ particles. We did not have a direct means of determining segregation, although radiographs taken of the

Fig. 11. Cross Section of a Ta-UO₂ Pellet. 17X.

loaded elements gave us a qualitative check of the oxide dispersions within a pellet. A typical positive radiograph of plutonium oxide-containing pellets is shown in Fig. 12. The flat end of the pellet was the bottom of the pellet during pressing. As shown in the radiograph, the containment of the plutonium oxide within the pellet jacket is good.

A typical metallographic section of plutonium oxide-containing pellets before and after the thermal treatment is shown in Fig. 13. The microstructure of all the pellets examined show that the aluminum was the continuous phase with the plutonium oxide existing as large angular particles. The thermal treatment had little effect on the microstructural appearance except for some sintering of the aluminum particles. As can be seen, there was no evidence of reaction between the aluminum and the plutonium oxide particles.

Fig. 12. Positive Radiograph of Portion of a Typical PuO_2 -Containing Target Element.

Fig. 13. Typical Microstructure of PuO₂-Al Pellet Cores (a) As-Fabricated, (b) After Thermal Cleaning at 550°C for 3 hr.

End Closure

The integrity of the welds was evaluated by helium leak testing and radiographic examination of the welds in at least three planes. The percentage of welds that were rejected because of leaks was small, in the order of 2 to 3%. Our main weld rejection test was the examination of the radiographs. In this examination, if the radiograph in any one of the three planes indicated an inclusion, crack, or bubble that caused the weld to have less thickness than the thickness of the parent tube, the rod was rejected. In final end-closure welding our percentage of acceptable welds was greater than 90%. A metallographic section of a typical weld (Fig. 14) shows the essential absence of weld porosity with the one-wall thickness weld penetration.

Fig. 14. Cross Section of a Typical HFIR Target Element Weld.

Contamination

All of the elements that were fabricated were completely free of transferable and embedded surface contamination. No particular difficulty was encountered in keeping these rods completely clean, and only 5% of the rods required additional cleaning after the welding step.

Assembled Elements

Photographs of typical assembled elements are shown in Fig. 15. The average parameters for the various elements are included in Table 5. The complete dimensional data for the first HFIR target elements are included in Appendix F, for the simulated HFIR target elements in Appendix G, and HFIR-SRL target elements in Appendix H. Figure 16 gives the position and orientation for the measurements in Appendices F, G, and H.

Fig. 15. Assembled HFIR Target Elements.

Table 5. Average Parameters for Target Elements

Parameters	Type of Element		
	HFIR	Simulated	SRL
Pellet weight, g	1.353	1.475	1.407
Pellet length, in.	0.570	0.569	0.569
Rod diameter, in.	0.354	0.355	0.355
Amount collapsed, in.	0.008	0.008	0.008
Rod weight, g	139.571	144.746	142.442
Element weight, g	210.649	216.935	213.186
Element length, in.	34.964	34.955	35.000 ^a

^aOn SRL elements the length was checked only to ensure that the element did not exceed 35 in.

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VIEW "A-A"
SCALE: 2" = 1"

Fig. 16. Diagram of HFIR Target Element Showing the Position and Orientation of Preirradiation Measurements.

SUMMARY AND CONCLUSIONS

Ninety-three HFIR target elements were fabricated using powder metallurgical, welding, mechanical forming, and nondestructive testing procedures. A new powder blending and dispensing technique used in the fabrication of the simulated and first-HFIR loading elements proved to be a vast improvement over the system used in earlier fabrication. Using this system the variation in the PuO_2 distribution from pellet-to-pellet was reduced by a factor greater than 2. The welding procedure developed for target fabrication was very satisfactory. Using the unique filler-metal weld joint design and by reducing pressure inside the tube during welding, we were able to produce better than 90% acceptable closure welds on the 3/8-in.-diam aluminum target tubes. No particular difficulty was encountered in keeping the target elements completely free of transferable or embedded surface contamination. In summary, the fabrication of these elements was accomplished with minimum difficulties.

ACKNOWLEDGMENT

The successful fabrication of these HFIR target elements required the concerted efforts of many persons. I would like to acknowledge those who made direct contributions to this effort.

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APPENDIX A

Design of HFIR Target Element

APPENDIX B

Procedure for the Preparation of PuO_2

PLUTONIUM OXIDE PREPARATION

The plutonium oxide was prepared by M. H. Lloyd of the Chemical Technology Division. The following process was developed to produce a coarse high-density oxide.

A solution of 0.5 M $\text{Pu}(\text{NO}_3)_4$ in 4 M HNO_3 was prepared from plutonium of spectrographic purity and was rapidly mixed with an equal volume of 8 M NH_4OH to precipitate $\text{Pu}(\text{OH})_4$. The precipitate was washed with 2 M NH_4OH , dried at 150°C , and fired at 1200°C . A glassy solid resulted with a density close to theoretical. Most of the particles were from 1 to 3 mm in diameter. Therefore, the material was ground and screened to reduce the particle size to the required range. The particle size distributions obtained by this operation are given in Table 1, p. 5, this report.

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APPENDIX C

Simulated HFIR Target Element Basis and Properties of Constituents

I. BASIS OF SIMULATED TARGET LOADING

Initial testing of the HFIR core will include the testing of a simulated plutonium target that will be capable of producing the maximum heat generation rates calculated for the presently proposed plutonium target.* The latter target would initially contain 265 g ^{242}Pu , approximately 3 g ^{241}Pu , and 3 g ^{242}Pu in 30 target rods. At the beginning of irradiation and at the time the ^{245}Cm concentration peaks, the calculated heat generation rates due to fissioning are equal to 663 kw.** It is proposed to load 31 target rods with enough ^{235}U and ^{238}U to produce an average of $663/30 = 22.1$ kw/rod with the reactor at 100 Mw. An appropriate amount of tantalum should be added to supplement the capture cross section.

Without specifying the particular ^{235}U enrichment to be used, the equations for determining the total weights of ^{235}U and tantalum for a 31-target-rod bundle are as follows:

$$w^{25} = \frac{685 \times (w^{25}/w^{28})}{84.9 \times (w^{25}/w^{28}) + 0.011} \text{ g} \quad (1)$$

$$w^{\text{Ta}} = 5.52 \times 10^3 \left[\frac{474(w^{25}/w^{28}) - 1}{7720(w^{25}/w^{28}) + 1} \right] \text{ g} \quad (2)$$

where

w^{25} indicates weight of ^{235}U ,

w^{28} indicates weight of ^{238}U ,

w^{Ta} indicates weight of tantalum.

These equations are plotted in Fig. C-1. In order to achieve the desired power density in the target it will be necessary to operate the reactor at full power (100 Mw) before a significant amount of the uranium in the target has been burned up at lower powers. But even after taking this precaution the uranium target will not exactly simulate the plutonium

*This target proposal was based on heat transfer and californium production, but not on the present availability of feed material.

**T. G. Chapman, HFIR Target Design Study, ORNL-TM-1084 (September 1965).

Fig. C-1. The Weight of Tantalum and ^{235}U as a Function of the Ratio of the Weight of ^{235}U to ^{238}U for Calculating the Loading of the Simulated HFIR Target with Uranium Feed Materials of Various Enrichments.

target insofar as heat transfer is concerned because the total energy release for the former will be less. However, since the target rod tests being conducted at the ETR do not as yet indicate any deleterious effects associated with total fissions, the above discrepancy is not expected to be important, unless perhaps there is a creep problem.

II. URANIUM DIOXIDE PROPERTIES

1. UCNC purchase order	33X 88479
2. Manufacturer	Spencer Chemical Company
3. Lot number	100-103-1D
4. Date shipped	April 14, 1960
5. Material	UO ₂
6. Mesh size	Mill run
7. Type	Fused
8. Enrichment, %	10
9. Water immersion density, g/cm ³	10.9
10. Uranium, wt %	88.67
11. H ₂ O, %	0.04
12. Oxygen-to-uranium ratio, ignition	1.90
13. Carbon, ppm	90
14. Emission Spectrographic Analysis (by Spencer Chemical Company), ppm	
Silver	0.3
Boron	0.2
Cadmium	< 1
Chromium	< 1
Copper	1
Iron	57
Nickel	3
Lead	2
Silicon	19
Tin	< 3
Fluorine	< 50
15. Isotopic Assay (by ORNL), %	
²³⁴ U	0.06
²³⁵ U	10.15
²³⁶ U	0.07
²³⁸ U	89.72

III. TANTALUM PROPERTIES

1. UCNC purchase order	33X 85611
2. Manufacturer	Wah Chang Corporation
3. Lot number	118 type 225
4. Production order number	6473-1

5.	Date shipped	July 10, 1964
6.	Density (tolerance), g/cm ³	16.67
7.	Gas release, g/cm ³ at STP	0.34
8.	Moisture, %	< 0.01
9.	Tantalum, %	99.9
10.	Spectrographic Analysis (by Wah Chang Corporation), ppm	
	Carbon	< 30
	Columbium	< 50
	Chromium	30
	Iron	210
	Hydrogen	50
	Nitrogen	85
	Nickel	< 10
	Oxygen	730
	Silicon	< 500
	Tungsten	< 10
11.	Screen Analysis (by ORNL)	
	<u>Mesh Size</u>	<u>%</u>
	+200	0.4
	-200 +230	3.5
	-230 +270	23.8
	-270 +325	43.2
	-325	29.1

APPENDIX D

Calculation of Pellet Fabrication

Given Calculations for Pellet Fabrication

1. Loading per element
 - (a) 8 g ^{242}Pu for first HFIR elements,
 - (b) 10 g ^{242}Pu for SRL elements,
 - (c) 2.95 g UO_2 (10% enriched) and 10.71 g Ta for simulated rods.
2. 20 in. active length per element.
3. Density of PuO_2 -Al matrix: 90% of theoretical.
4. 35 pellets per fuel element.
5. Pellet diameter $D_F = 0.250$ in.
6. Pellet tube outside diameter $D_0 = 0.248$ in.
7. Pellet tube inside diameter $d_0 = 0.218$ in.
8. Pellet tube length $L_0 = 0.900$ in.
9. Particle densities
 - (a) $\rho_{\text{PuO}_2} = 11.47 \text{ g/cm}^3$,
 - (b) $\rho_{\text{UO}_2} = 10.9 \text{ g/cm}^3$,
 - (c) $\rho_{\text{Ta}} = 16.3 \text{ g/cm}^3$.
10. Density of aluminum $\rho_{\text{Al}} = 2.70 \text{ g/cm}^3$.
11. Length of end caps (2 per pellet) $L_c = 0.050$ in. each.

Calculations (Constant for all Pellets)

Core

12. Pellet length from (2) and (4): $L_F = 20/35 = 0.571$ in.
13. Outside diameter of core, d_2 , calculated from (5), (6), (7), (8), and (12), recognizing that the volume of the pellet tube is not changed during pressing:

$$\begin{aligned}
 d_2^2 &= \left[D_F^2 - (D_0^2 - d_0^2) \right] L_0 / L_F \\
 &= (0.250)^2 - (0.248^2 - 0.218^2) \frac{0.900}{0.571} = 0.0404 \\
 d_2 &= 0.201 \text{ in.}
 \end{aligned}$$

14. Core volume V_c , from (11), (12), and (13):

$$\begin{aligned} V_c &= d_2^2 (L_F - 2L_c) \times (\pi/4) (2.54 \text{ cm/in.})^3 \\ &= 0.0404 (0.571 - 0.100) (12.87) \\ &= 0.0404 (0.471) (12.87) = 0.245 \text{ cm}^3 . \end{aligned}$$

15. Void volume per core V_v from (3) and (14):

$$\begin{aligned} V_v &= V_c (100 - \text{pellet theoretical density, \%}) / 100 \\ &= 0.245 (100 - 90) / 100 = 0.0245 \text{ cm}^3 . \end{aligned}$$

End Caps

16. Total volume of end cap V_{ec} from (11) and (13):

$$\begin{aligned} V_{ec} &= d_2^2 L_c (\pi/4) (2.54 \text{ cm/in.})^3 \\ &= (0.040) (0.050) (12.87) = 0.0260 \text{ cm}^3 . \end{aligned}$$

17. Volume of aluminum in end cap V_{eA} from (3) and (16):

$$\begin{aligned} V_{eA} &= V_{ec} \times (1.00 - 0.9) \\ V_{eA} &= 0.0260 \times 0.9 = 0.0234 . \end{aligned}$$

18. Weight of aluminum in end cap W_{ec} from (10) and (17):

$$W_{ec} = V_{eA} \rho_{Al} = (0.0234) (2.70) = 0.063 \text{ g} .$$

Calculations for First HFIR Elements

Core

19. Weight of PuO_2 per element from (1a):

$$\begin{aligned} W_{E1} &= \text{wt Pu} \times \frac{\text{mol. wt PuO}_2}{\text{at. wt Pu}} \\ &= \frac{8 \times 274}{242} = 9.057 \text{ g} . \end{aligned}$$

20. Weight of PuO_2 per pellet W_P from (4) and (19):

$$W_{P1} = W_{E1}/35 = 0.259 \text{ g} .$$

21. Volume of PuO_2 per core V_P , from (9a) and (20):

$$V_{P1} = W_P / \rho_{\text{PuO}_2} = 0.259 \text{ g} / 11.47 \text{ g/cm}^3 = 0.02256 \text{ cm}^3 .$$

22. Volume of aluminum per core V_{A1} from (14), (15), and (21):

$$\begin{aligned} V_{A1} &= V_C - V_{P1} - V_V \\ &= 0.245 - 0.02256 - 0.0245 = 0.1979 \text{ cm}^3 . \end{aligned}$$

23. Weight of aluminum W_{A1} per core from (10) and (22):

$$W_{A1} = V_{A1} \rho_{Al} = 0.1979 \times 2.70 = 0.534 \text{ g} .$$

24. Total core weight W_{c1} from (20) and (23):

$$W_{c1} = W_{A1} + W_{P1} = 0.534 + 0.259 = 0.793 \text{ g} .$$

Calculations for SRL Elements

Core

25. Weight of PuO_2 per element from (1b):

$$\begin{aligned} W_{E2} &= \text{wt Pu} \times \frac{\text{mol. wt PuO}_2}{\text{at. wt Pu}} \\ &= \frac{10 \times 274}{242} = 11.32 \text{ g} . \end{aligned}$$

26. Weight of PuO_2 per pellet w_P from (4) and (25):

$$w_{P2} = w_{E2} / 35 = 0.324 \text{ g} .$$

27. Volume of PuO_2 per core V_P , from (9b) and (26):

$$V_{P2} = w_{P2} / \rho_{\text{PuO}_2} = \frac{0.324 \text{ g}}{11.47 \text{ g/cm}^3} = \underline{0.0282 \text{ cm}^3} .$$

28. Volume of aluminum per core V_A from (14), (15), and (27):

$$\begin{aligned} V_{A2} &= V_c - V_{P2} - V_v \\ &= 0.245 - 0.0282 - 0.0245 = 0.1923 \text{ cm}^3 . \end{aligned}$$

29. Weight of aluminum W_A per core from (10) and (28):

$$W_{A2} = V_{A2} \rho_{Al} = 0.1923 \times 2.70 = 0.519 .$$

30. Total core weight W_c from (26) and (28):

$$W_{c2} = W_{A2} + W_{P2} = 0.519 + 0.324 = 0.843 .$$

Calculations for Simulated Elements

Core

31. Weight of UO_2 per pellet from (1c) and (4):

$$W_U = 2.95/35 = 0.084 \text{ g} .$$

32. Weight of Ta per pellet from (1c) and (4):

$$W_{Ta} = 10.71/35 = 0.306 \text{ g} .$$

33. Volume of Ta and UO_2 (V_{P3}) per core from (9b), (9c), (31), and (32):

$$V_u = W_u / \rho_{\text{UO}_2} = 0.093/10.9 = \underline{0.00773} \text{ cm}^3$$

$$V_T = W_T / \rho_{Ta} = 0.306/16.7 = \underline{0.0180}$$

$$V_{P3} = V_u + V_T$$

$$V_{P3} = \underline{0.0257} \text{ cm}^3 .$$

34. Volume of aluminum per core V_{A3} from (14), (15), and (33):

$$V_{A3} = V_c - V_{P3} - V_v$$

$$= 0.230 - 0.0257 - 0.023 = 0.19435 \text{ cm}^3 .$$

35. Weight of aluminum W_{A3} per core from (10) and (34):

$$W_{A3} = V_{A3} \rho_{Al} = 0.19435 \times 2.70 = 0.524 \text{ g} .$$

36. Total core weight W_{c3} from (31), (32), and (35):

$$W_{c3} = W_{A3} + W_u + W_T = 0.524 + 0.306 + 0.084 = 914 \text{ g} .$$

APPENDIX E

Pellet Fabrication Data

Table E-1. Pellet Fabrication Data for Elements Containing 8 g ^{242}Pu

Batch Number	Number Pellets	Weight, g			Length, in.			
		Specific ^a	Average	Standard Deviation	Average	Standard Deviation	Maximum ^b	Minimum ^c
2	37	1.367	1.355	0.003	0.568	0.005	0.579	0.555
3	37	1.365	1.365	0.003	0.570	0.003	0.577	0.564
4	37	1.365	1.351	0.001	0.570	0.002	0.574	0.565
5	37	1.355	1.354	0.003	0.569	0.002	0.575	0.564
6	37	1.355	1.355	0.004	0.570	0.003	0.583	0.566
7	37	1.355	1.348	0.004	0.567	0.003	0.572	0.561
8	34	1.355	1.340	0.009	0.567	0.005	0.581	0.555
9	37	1.365	1.367	0.007	0.575	0.003	0.584	0.566
10	37	1.360	1.355	0.007	0.571	0.003	0.577	0.561
11	37	1.360	1.357	0.005	0.571	0.002	0.576	0.566
12	37	1.358	1.362	0.008	0.574	0.003	0.582	0.566
13	36	1.350	1.347	0.006	0.567	0.003	0.573	0.562
14	37	1.350	1.343	0.006	0.566	0.003	0.579	0.562
15	37	1.355	1.353	0.002	0.570	0.002	0.577	0.565
16	37	1.355	1.349	0.004	0.570	0.002	0.575	0.566
17	37	1.355	1.355	0.009	0.569	0.003	0.580	0.564
18	37	1.355	1.354	0.004	0.570	0.003	0.578	0.561
19	37	1.355	1.354	0.002	0.570	0.002	0.577	0.566
20	37	1.360	1.360	0.009	0.573	0.003	0.579	0.561
21	37	1.345	1.349	0.007	0.568	0.004	0.585	0.564
22	37	1.355	1.353	0.003	0.573	0.005	0.594	0.565
23	37	1.355	1.343	0.004	0.568	0.002	0.572	0.564
24	37	1.355	1.344	0.004	0.568	0.003	0.573	0.562
25	37	1.350	1.368	0.010	0.579	0.004	0.585	0.568
26	37	1.363	1.337	0.004	0.561	0.003	0.570	0.554
27	37	1.363	1.358	0.008	0.572	0.003	0.579	0.566
28	37	1.355	1.351	0.010	0.566	0.004	0.579	0.559
29	37	1.355	1.354	0.006	0.570	0.002	0.579	0.563
30	36	1.360	1.331	0.001	0.561	0.002	0.567	0.557
31	37	1.355	1.348	0.003	0.568	0.005	0.577	0.559
32	37	1.355	1.350	0.005	0.570	0.002	0.576	0.565
33	37	1.356	1.356	0.004	0.576	0.003	0.587	0.570
34	37	1.356	1.357	0.004	0.577	0.003	0.584	0.569
35	37	1.355	1.359	0.003	0.576	0.002	0.580	0.571
36	37	1.350	1.355	0.002	0.578	0.002	0.583	0.571
37	37	1.358	1.360	0.003	0.575	0.002	0.581	0.571
38	39	1.353	1.348	0.004	0.568	0.003	0.577	0.562
39	39	1.360	1.352	0.004	0.570	0.004	0.580	0.563
40	37	1.358	1.357	0.011	0.571	0.003	0.581	0.563
41	37	1.358	1.348	0.004	0.569	0.003	0.573	0.562
42	37	1.358	1.358	0.004	0.570	0.005	0.581	0.563

^aSpecific weight of pellet calculated from the average pellet liner weight, the core weight, and the bottom and top cap weight.

^bMaximum pellet length in pellet batch.

^cMinimum pellet length in pellet batch.

Table E-2. Pellet Fabrication Data for Elements Containing
2.9 g UO₂ and 10 g Ta

Batch Number	Number Pellets	Weight, g			Length, in.			
		Specific ^a	Average	Standard Deviation	Average	Standard Deviation	Maximum ^b	Minimum ^c
1	39	1.477	1.475	0.004	0.567	0.004	0.577	0.560
2	39	1.477	1.476	0.004	0.581	0.004	0.589	0.572
3	39	1.477	1.475	0.004	0.570	0.005	0.586	0.563
4	38	1.477	1.475	0.005	0.571	0.004	0.583	0.564
5	39	1.477	1.470	0.005	0.568	0.004	0.578	0.556
6	39	1.477	1.475	0.004	0.567	0.003	0.573	0.560
7	39	1.477	1.474	0.003	0.568	0.002	0.572	0.563
8	39	1.477	1.474	0.004	0.573	0.003	0.582	0.566
9	39	1.477	1.471	0.003	0.570	0.002	0.573	0.564
10	39	1.477	1.472	0.004	0.570	0.002	0.573	0.566
11	39	1.477	1.465	0.003	0.568	0.002	0.574	0.565
12	39	1.477	1.469	0.004	0.566	0.002	0.572	0.560
13	39	1.477	1.467	0.004	0.572	0.004	0.579	0.564
14	38	1.477	1.463	0.003	0.569	0.005	0.583	0.560
15	39	1.477	1.457	0.004	0.567	0.004	0.575	0.559
16	38	1.477	1.459	0.004	0.571	0.006	0.588	0.561
17	39	1.477	1.466	0.003	0.562	0.002	0.567	0.557
18	39	1.487	1.477	0.006	0.570	0.003	0.575	0.560
19	39	1.490	1.480	0.003	0.570	0.002	0.575	0.566
20	39	1.490	1.480	0.004	0.568	0.002	0.573	0.563
21	38	1.477	1.476	0.003	0.568	0.005	0.579	0.556
22	39	1.478	1.480	0.004	0.569	0.004	0.580	0.560
23	39	1.484	1.481	0.002	0.570	0.003	0.574	0.563
24	39	1.482	1.480	0.008	0.569	0.004	0.577	0.562
25	38	1.482	1.481	0.003	0.569	0.002	0.573	0.563
26	39	1.482	1.477	0.002	0.566	0.002	0.574	0.562
27	39	1.482	1.476	0.003	0.567	0.002	0.571	0.563
28	39	1.482	1.475	0.004	0.569	0.003	0.577	0.562
29	39	1.482	1.475	0.002	0.569	0.003	0.575	0.565
30	39	1.482	1.474	0.003	0.567	0.002	0.570	0.562
31	39	1.486	1.480	0.004	0.570	0.002	0.575	0.567
32	39	1.486	1.481	0.003	0.569	0.003	0.577	0.563
33	39	1.484	1.480	0.002	0.572	0.003	0.580	0.564
34	39	1.484	1.472	0.004	0.568	0.003	0.573	0.561
35	39	1.486	1.470	0.003	0.567	0.002	0.571	0.561
36	39	1.484	1.474	0.004	0.567	0.003	0.574	0.560
37	39	1.485	1.478	0.003	0.570	0.002	0.574	0.566
38	39	1.485	1.479	0.005	0.570	0.003	0.576	0.564
39	39	1.485	1.478	0.005	0.572	0.004	0.585	0.563
40	39	1.484	1.485	0.003	0.572	0.003	0.579	0.565

^aSpecific weight of pellet calculated from the average pellet liner weight, the core weight, and the bottom and top cap weight.

^bMaximum pellet length in pellet batch.

^cMinimum pellet length in pellet batch.

Table E-3. Pellet Fabrication Data for Elements Containing 10 g ^{242}Pu

Batch Number	Number Pellets	Weight, g			Length, in.			
		Specific ^a	Average	Standard Deviation	Average	Standard Deviation	Maximum ^b	Minimum ^c
1	40	1.407	1.410	0.004	0.570	0.015	0.611	0.547
2	40	1.407	1.405	0.004	0.565	0.014	0.595	0.539
3	39	1.407	1.405	0.006	0.564	0.010	0.585	0.548
4	39	1.407	1.408	0.010	0.572	0.010	0.596	0.554
5	39	1.407	1.404	0.004	0.568	0.009	0.588	0.551
6	39	1.407	1.410	0.006	0.571	0.010	0.596	0.554
7	37	1.407	1.407	0.007	0.567	0.011	0.590	0.543
8	39	1.407	1.404	0.004	0.560	0.011	0.582	0.536
9	39	1.407	1.408	0.008	0.578	0.012	0.611	0.559
10	40	1.407	1.408	0.007	0.575	0.015	0.636	0.533
11	39	1.407	1.405	0.005	0.571	0.012	0.599	0.549
12	39	1.407	1.406	0.005	0.573	0.009	0.589	0.552
13	40	1.407	1.408	0.006	0.567	0.022	0.620	0.488
14	40	1.407	1.406	0.005	0.568	0.008	0.590	0.546
15	40	1.407	1.403	0.004	0.570	0.015	0.622	0.526
16	40	1.407	1.406	0.003	0.569	0.015	0.597	0.535
17	40	1.407	1.402	0.014	0.572	0.011	0.604	0.546
18	40	1.407	1.406	0.004	0.571	0.011	0.592	0.550

^aSpecific weight of pellet calculated from the average pellet liner weight, the core weight, and the bottom and top cap weight.

^bMaximum pellet length in pellet batch.

^cMinimum pellet length in pellet batch.

APPENDIX F

Dimensional Data on ^{242}Pu HFIR Target Elements

TABLE F-1. DIMENSIONAL AND PELLET DATA ON ELEMENT D 10

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	22
ROD WEIGHT	139.017 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	210.265 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.979 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3520	.3520			
2	3.0	.3520	.3530	.0075		
3	7.0	.3520	.3520	.0090	.016	
4	9.5	.3530	.3520	.0095	.010	.128
5	12.5	.3510	.3510	.0090	.007	.130
6	14.5	.3540	.3540	.0090	.005	
7	18.0	.3540	.3540	.0080	.007	.130
8	20.5	.3520	.3520	.0090	.013	.128
9	22.0	.3540	.3540	.0090	.018	
10	24.5	.3570	.3570	.0070	.024	.129
11	28.5	.3560	.3570	.0075	.018	.127
12	30.0	.3580	.3560	.0070		.121
13	33.5	.3530	.3550			

TABLE F-2. DIMENSIONAL AND PELLET DATA ON ELEMENT D 12

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	32
ROD WEIGHT	139.300 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	210.285 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.968 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3540			
2	3.0	.3530	.3540	.0075		
3	7.0	.3520	.3530	.0095	.017	
4	9.5	.3540	.3550	.0095	.021	.130
5	12.5	.3530	.3530	.0100	.015	.128
6	14.5	.3540	.3540	.0085	.018	
7	18.0	.3570	.3540	.0075	.011	.130
8	20.5	.3530	.3540	.0095	.013	.128
9	22.0	.3520	.3530	.0095	.010	
10	24.5	.3570	.3540	.0065	.009	.130
11	28.5	.3570	.3550	.0065	.007	.128
12	30.0	.3550	.3540	.0080		.123
13	33.5	.3550	.3540			

TABLE F-3 . DIMENSIONAL AND PELLET DATA ON ELEMENT D 14

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	4
ROD WEIGHT	139.260 G.	PELLET WEIGHT AVG.	1.351 G.
ELEMENT WEIGHT	210.375 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.976 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH I.D.	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 9n DEG.	COLLAPSE	SHEATH TIR	SHEATH MAX.	SPACE MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3520			
2	3.0	.3530	.3530	.0075		
3	7.0	.3540	.3540	.0090	.009	
4	9.5	.3540	.3530	.0080	.008	.128
5	12.5	.3540	.3530	.0090	.008	.123
6	14.5	.3530	.3520	.0100	.005	
7	18.0	.3530	.3520	.0095	.006	.127
8	20.5	.3530	.3530	.0095	.007	.124
9	22.0	.3540	.3540	.0090	.008	
10	24.5	.3550	.3540	.0065	.007	.126
11	28.5	.3550	.3540	.0080	.012	.124
12	30.0	.3530	.3530	.0085		.118
13	33.5	.3540	.3540			

TABLE F-4 . DIMENSIONAL AND PELLET DATA ON ELEMENT D 18

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	34
ROD WEIGHT	138.718 G.	PELLET WEIGHT AVG.	1.357 G.
ELEMENT WEIGHT	209.620 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.972 IN.	PELLET LENGTH AVG.	.576 IN.
MAX SHEATH I.D.	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 9n DEG.	COLLAPSE	SHEATH TIR	SHEATH MAX.	SPACE MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3540	.3540			
2	3.0	.3540	.3540	.0070		
3	7.0	.3530	.3530	.0090	.009	
4	9.5	.3540	.3540	.0080	.005	.125
5	12.5	.3500	.3530	.0105	.006	.126
6	14.5	.3530	.3530	.0090	.007	
7	18.0	.3550	.3550	.0080	.009	.125
8	20.5	.3530	.3530	.0090	.009	.125
9	22.0	.3520	.3490	.0100	.008	
10	24.5	.3540	.3490	.0095	.011	.127
11	28.5	.3560	.3530	.0075	.018	.125
12	30.0	.3540	.3530	.0080		.120
13	33.5	.3550	.3530			

TABLE F-5. DIMENSIONAL AND PELLET DATA ON ELEMENT D 19

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	23
ROD WEIGHT	138.466 G.	PELLET WEIGHT AVG.	1.344 G.
ELEMENT WEIGHT	209.340 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.962 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 9n DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3540	.3530			
2	3.0	.3530	.3530	.0070		
3	7.0	.3510	.3510	.0090	.017	
4	9.5	.3500	.3530	.0100	.015	.125
5	12.5	.3520	.3520	.0080	.014	.130
6	14.5	.3520	.3520	.0080	.013	
7	18.0	.3540	.3530	.0085	.015	.127
8	20.5	.3520	.3520	.0080	.016	.130
9	22.0	.3520	.3520	.0080	.016	
10	24.5	.3510	.3500	.0090	.019	.130
11	28.5	.3520	.3520	.0080	.017	.130
12	30.0	.3560	.3560	.0070		.127
13	33.5	.3530	.3530			

TABLE F-6. DIMENSIONAL AND PELLET DATA ON ELEMENT D 21

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	11
ROD WEIGHT	139.118 G.	PELLET WEIGHT AVG.	1.357 G.
ELEMENT WEIGHT	210.225 G.	PELLET WT. STD. D.	.006 G.
ELEMENT LENGTH	34.970 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 9n DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3530			
2	3.0	.3540	.3530	.0075		
3	7.0	.3520	.3530	.0085	.013	
4	9.5	.3480	.3530	.0085	.015	.124
5	12.5	.3490	.3520	.0095	.017	.129
6	14.5	.3530	.3520	.0085	.014	
7	18.0	.3540	.3550	.0085	.021	.125
8	20.5	.3530	.3530	.0090	.027	.125
9	22.0	.3520	.3520	.0095	.033	.119
10	24.5	.3550	.3550	.0080	.041	.125
11	28.5	.3540	.3540	.0070	.034	.128
12	30.0	.3580	.3560	.0065		.116
13	33.5	.3530	.3520			

TABLE F-7. DIMENSIONAL AND PELLET DATA ON ELEMENT D 23

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	7
ROD WEIGHT	140.733 G.	PELLET WEIGHT AVG.	1.349 G.
ELEMENT WEIGHT	211.640 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.988 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER IN. DEG. 90 DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3540			
2	3.0	.3530	.3530	.0070		
3	7.0	.3560	.3560	.0090	.009	
4	9.5	.3570	.3560	.0085	.013	.126
5	12.5	.3550	.3560	.0085	.015	.123
6	14.5	.3560	.3560	.0080	.014	.117
7	18.0	.3570	.3560	.0085	.012	.125
8	20.5	.3550	.3550	.0090	.013	.125
9	22.0	.3570	.3550	.0080	.014	.118
10	24.5	.3580	.3570	.0065	.016	.130
11	26.5	.3580	.3570	.0055	.022	.123
12	30.0	.3580	.3570	.0055		.116
13	33.5	.3550	.3540			

TABLE F-8. DIMENSIONAL AND PELLET DATA ON ELEMENT D 24

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	20
ROD WEIGHT	139.155 G.	PELLET WEIGHT AVG.	1.362 G.
ELEMENT WEIGHT	217.517 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.972 IN.	PELLET LENGTH AVG.	.573 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER IN. DEG. 90 DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3520			
2	3.0	.3520	.3520	.0080		
3	7.0	.3540	.3550	.0090	.017	
4	9.5	.3510	.3540	.0100	.019	.127
5	12.5	.3520	.3540	.0085	.018	.124
6	14.5	.3540	.3560	.0085	.016	.117
7	18.0	.3540	.3530	.0080	.012	.125
8	20.5	.3540	.3540	.0075	.007	.121
9	22.0	.3540	.3550	.0085	.008	.125
10	24.5	.3540	.3560	.0070	.008	.125
11	26.5	.3560	.3560	.0065	.009	.127
12	30.0	.3560	.3560	.0070		.115
13	33.5	.3550	.3530			

TABLE F-9. DIMENSIONAL AND PELLET DATA ON ELEMENT D 28

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	15
ROD WEIGHT	139.940 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	211.810 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.940 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.		COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3550	.3540			
2	3.0	.3530	.3540	.0075		
3	7.0	.3550	.3550	.0090	.013	
4	9.5	.3540	.3550	.0085	.012	.124 .115
5	12.5	.3540	.3550	.0085	.010	.122 .118
6	14.5	.3550	.3540	.0090	.011	
7	18.0	.3540	.3550	.0080	.009	.124 .119
8	20.5	.3530	.3530	.0095	.016	.123 .120
9	22.0	.3540	.3550	.0090	.019	
10	24.5	.3580	.3570	.0055	.027	.127 .114
11	28.5	.3560	.3560	.0075	.020	.125 .114
12	30.0	.3580	.3570	.0060		
13	33.5	.3530	.3530			

TABLE F-10. DIMENSIONAL AND PELLET DATA ON ELEMENT D 29

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	27
ROD WEIGHT	140.056 G.	PELLET WEIGHT AVG.	1.357 G.
ELEMENT WEIGHT	211.120 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.		COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3530	.3540			
2	3.0	.3520	.3540	.0070		
3	7.0	.3550	.3560	.0080	.006	
4	9.5	.3550	.3530	.0090	.004	.127 .120
5	12.5	.3550	.3540	.0090	.004	.127 .120
6	14.5	.3560	.3540	.0085	.004	
7	18.0	.3550	.3540	.0095	.001	.130 .116
8	20.5	.3550	.3550	.0090	.003	.128 .121
9	22.0	.3550	.3530	.0100	.004	
10	24.5	.3540	.3570	.0080	.009	.129 .121
11	28.5	.3560	.3570	.0070	.008	.125 .119
12	30.0	.3560	.3550	.0075		
13	33.5	.3530	.3530			

TABLE F-11. DIMENSIONAL AND PELLET DATA ON ELEMENT D 30

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	12
ROD WEIGHT	138.652 G.	PELLET WEIGHT AVG.	1.364 G.
ELEMENT WEIGHT	209.785 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.948 IN.	PELLET LENGTH AVG.	.574 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3520	.3540			
2	3.0	.3540	.3540	.0065		
3	7.0	.3520	.3530	.0080	.013	
4	9.5	.3500	.3550	.0060	.014	.125
5	12.5	.3520	.3560	.0065	.014	.126
6	14.5	.3530	.3540	.0085	.015	.120
7	18.0	.3530	.3540	.0080	.018	.130
8	20.5	.3510	.3510	.0085	.016	.115
9	22.0	.3540	.3520	.0070	.012	.130
10	24.5	.3540	.3550	.0070	.014	.117
11	28.5	.3530	.3530	.0070	.023	.127
12	30.0	.3580	.3580	.0060	.023	.126
13	33.5	.3540	.3560			.124

TABLE F-12. DIMENSIONAL AND PELLET DATA ON ELEMENT D 31

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	17
ROD WEIGHT	139.260 G.	PELLET WEIGHT AVG.	1.352 G.
ELEMENT WEIGHT	211.100 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.953 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3520			
2	3.0	.3530	.3540	.0075		
3	7.0	.3530	.3540	.0095	.009	
4	9.5	.3520	.3530	.0095	.005	.126
5	12.5	.3540	.3530	.0090	.004	.117
6	14.5	.3540	.3550	.0085	.005	.125
7	18.0	.3550	.3550	.0080	.007	.120
8	20.5	.3550	.3560	.0080	.005	.127
9	22.0	.3540	.3550	.0085	.003	.123
10	24.5	.3560	.3580	.0065	.007	.118
11	28.5	.3570	.3580	.0060	.014	.120
12	30.0	.3520	.3520	.0075	.014	.124
13	33.5	.3540	.3530			.121

TABLE F-13. DIMENSIONAL AND PELLET DATA ON ELEMENT D 33

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	21
ROD WEIGHT	139.499 G.	PELLET WEIGHT AVG.	1.348 G.
ELEMENT WEIGHT	210.745 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.977 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3520 .3550			
2	3.0	.3530 .3540	.0070		
3	7.0	.3540 .3540	.0090	.010	
4	9.5	.3550 .3530	.0080	.009	.125 .113
5	12.5	.3540 .3530	.0080	.007	.124 .120
6	14.5	.3540 .3530	.0090	.007	
7	18.0	.3550 .3540	.0090	.008	.126 .117
8	20.5	.3530 .3530	.0090	.008	.125 .120
9	22.0	.3530 .3530	.0090	.009	
10	24.5	.3560 .3560	.0060	.011	.128 .115
11	28.5	.3560 .3540	.0070	.004	.127 .117
12	30.0	.3570 .3580	.0065		
13	33.5	.3530 .3540			

TABLE F-14. DIMENSIONAL AND PELLET DATA ON ELEMENT D 35

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	31
ROD WEIGHT	138.875 G.	PELLET WEIGHT AVG.	1.349 G.
ELEMENT WEIGHT	209.815 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.966 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3540 .3520			
2	3.0	.3550 .3520	.0075		
3	7.0	.3540 .3540	.0090	.008	
4	9.5	.3530 .3540	.0095	.013	.130 .118
5	12.5	.3520 .3520	.0090	.015	.129 .120
6	14.5	.3540 .3540	.0090	.013	
7	18.0	.3540 .3530	.0090	.011	.130 .120
8	20.5	.3530 .3520	.0090	.008	.130 .123
9	22.0	.3530 .3520	.0085	.008	
10	24.5	.3560 .3550	.0065	.010	.129 .124
11	28.5	.3560 .3540	.0070	.014	.129 .121
12	30.0	.3560 .3540	.0070		
13	33.5	.3540 .3530			

TABLE F-15. DIMENSIONAL AND PELLET DATA ON ELEMENT D 37

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	30
ROD WEIGHT	139.290 G.	PELLET WEIGHT AVG.	1.332 G.
ELEMENT WEIGHT	210.170 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.965 IN.	PELLET LENGTH AVG.	.561 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN. IN.	IN.	IN.	IN. IN.
1	1.0	.3530 .3540			
2	3.0	.3530 .3530	.0070		
3	7.0	.3530 .3530	.0090	.020	
4	9.5	.3530 .3520	.0095	.025	.130 .116
5	12.5	.3540 .3560	.0085	.025	.130 .112
6	14.5	.3520 .3530	.0090	.024	
7	18.0	.3520 .3540	.0095	.019	.130 .119
8	20.5	.3550 .3560	.0080	.009	.130 .116
9	22.0	.3520 .3530	.0090	.004	
10	24.5	.3550 .3560	.0065	.003	.130 .120
11	28.5	.3580 .3590	.0060	.007	.125 .119
12	30.0	.3580 .3580	.0070		
13	33.5	.3540 .3530			

TABLE F-16. DIMENSIONAL AND PELLET DATA ON ELEMENT D 39

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	13
ROD WEIGHT	138.257 G.	PELLET WEIGHT AVG.	1.348 G.
ELEMENT WEIGHT	209.240 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	34.984 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN. IN.	IN.	IN.	IN. IN.
1	1.0	.3540 .3550			
2	3.0	.3540 .3540	.0070		
3	7.0	.3500 .3520	.0085	.004	
4	9.5	.3510 .3530	.0085	.006	.124 .119
5	12.5	.3510 .3510	.0075	.008	.129 .119
6	14.5	.3510 .3520	.0080	.009	
7	18.0	.3530 .3530	.0090	.012	.129 .116
8	20.5	.3510 .3510	.0085	.014	.130 .120
9	22.0	.3500 .3510	.0085	.013	
10	24.5	.3540 .3540	.0075	.014	.126 .119
11	28.5	.3530 .3530	.0070	.013	.128 .122
12	30.0	.3580 .3570	.0065		
13	33.5	.3540 .3520			

TABLE F-17. DIMENSIONAL AND PELLET DATA ON ELEMENT D 51

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	6
ROD WEIGHT	138.721 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	209.940 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.980 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.	
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3520			
2	3.0	.3530	.3540	.0075		
3	7.0	.3540	.3530	.0080	.014	
4	9.5	.3470	.3490	.0090	.019	.127 .117
5	12.5	.3520	.3510	.0090	.018	.126 .119
6	14.5	.3550	.3540	.0085	.016	
7	18.0	.3510	.3520	.0085	.011	.126 .123
8	20.5	.3530	.3530	.0080	.012	.126 .119
9	22.0	.3550	.3540	.0090	.016	
10	24.5	.3550	.3560	.0080	.020	.128 .116
11	28.5	.3560	.3560	.0070	.015	.124 .119
12	30.0	.3530	.3530	.0065		
13	33.5	.3550	.3530			

TABLE F-18. DIMENSIONAL AND PELLET DATA ON ELEMENT D 52

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	5
ROD WEIGHT	139.419 G.	PELLET WEIGHT AVG.	1.354 G.
ELEMENT WEIGHT	210.775 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.954 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.	
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3540			
2	3.0	.3540	.3540	.0070		
3	7.0	.3540	.3550	.0085	.012	
4	9.5	.3540	.3500	.0090	.013	.124 .120
5	12.5	.3540	.3520	.0085	.013	.130 .118
6	14.5	.3540	.3550	.0085	.012	
7	18.0	.3510	.3550	.0090	.012	.130 .115
8	20.5	.3530	.3550	.0085	.012	.128 .120
9	22.0	.3550	.3540	.0080	.015	
10	24.5	.3550	.3540	.0075	.016	.130 .113
11	28.5	.3550	.3560	.0070	.014	.128 .121
12	30.0	.3550	.3560	.0065		
13	33.5	.3530	.3540			

TABLE F-19. DIMENSIONAL AND PELLET DATA ON ELEMENT D 58

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	33
ROD WEIGHT	139.465 G.	PELLET WEIGHT AVG.	1.354 G.
ELEMENT WEIGHT	210.565 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.952 IN.	PELLET LENGTH AVG.	.575 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3540			
2	3.0	.3540	.3530	.0075		
3	7.0	.3550	.3550	.0085	.016	
4	9.5	.3540	.3540	.0110	.017	.123
5	12.5	.3530	.3530	.0100	.015	.127
6	14.5	.3530	.3550	.0080	.014	.115
7	18.0	.3530	.3540	.0085	.012	.129
8	20.5	.3540	.3530	.0090	.013	.125
9	22.0	.3560	.3560	.0070	.013	
10	24.5	.3570	.3570	.0055	.018	.128
11	28.5	.3580	.3540	.0070	.017	.124
12	30.0	.3540	.3540	.0105		.118
13	33.5	.3530	.3540			

TABLE F-20. DIMENSIONAL AND PELLET DATA ON ELEMENT D 59

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	36
ROD WEIGHT	139.259 G.	PELLET WEIGHT AVG.	1.355 G.
ELEMENT WEIGHT	210.195 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.996 IN.	PELLET LENGTH AVG.	.577 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3520	.3540			
2	3.0	.3540	.3540	.0065		
3	7.0	.3540	.3540	.0085	.019	
4	9.5	.3530	.3520	.0085	.017	.127
5	12.5	.3530	.3530	.0085	.017	.125
6	14.5	.3530	.3530	.0085	.018	.123
7	18.0	.3550	.3540	.0085	.013	.130
8	20.5	.3540	.3530	.0085	.015	.116
9	22.0	.3530	.3530	.0080	.021	.119
10	24.5	.3550	.3560	.0070	.024	.128
11	28.5	.3560	.3550	.0065	.011	.118
12	30.0	.3570	.3570	.0060		.121
13	33.5	.3520	.3540			

TABLE F-21. DIMENSIONAL AND PELLET DATA ON ELEMENT D 61

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	18
ROD WEIGHT	140.580 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	211.545 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.981 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH MAX.	SPACE MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3540	.3540			
2	3.0	.3530	.3540	.0070		
3	7.0	.3560	.3550	.0085	.005	
4	9.5	.3550	.3570	.0080	.004	.126
5	12.5	.3560	.3570	.0085	.007	.124
6	14.5	.3560	.3560	.0080	.007	
7	18.0	.3570	.3560	.0085	.010	.125
8	20.5	.3560	.3550	.0085	.013	.124
9	22.0	.3550	.3560	.0085	.016	
10	24.5	.3550	.3570	.0080	.016	.128
11	28.5	.3570	.3570	.0065	.005	.123
12	30.0	.3550	.3540	.0110		
13	33.5	.3540	.3550			

TABLE F-22. DIMENSIONAL AND PELLET DATA ON ELEMENT D 63

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	25
ROD WEIGHT	139.601 G.	PELLET WEIGHT AVG.	1.374 G.
ELEMENT WEIGHT	210.855 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.936 IN.	PELLET LENGTH AVG.	.580 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH MAX.	SPACE MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3540	.3530			
2	3.0	.3540	.3530	.0075		
3	7.0	.3540	.3550	.0085	.019	
4	9.5	.3530	.3550	.0080	.017	.125
5	12.5	.3530	.3550	.0085	.023	.125
6	14.5	.3540	.3550	.0080	.021	
7	18.0	.3550	.3540	.0085	.013	.125
8	20.5	.3540	.3540	.0080	.009	.124
9	22.0	.3540	.3540	.0085	.007	
10	24.5	.3560	.3570	.0060	.004	.127
11	28.5	.3560	.3560	.0075	.023	.124
12	30.0	.3550	.3550	.0075		
13	33.5	.3490	.3530			

TABLE F-23. DIMENSIONAL AND PELLET DATA ON ELEMENT D 65

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	28
ROD WEIGHT	138.698 G.	PELLET WEIGHT AVG.	1.354 G.
ELEMENT WEIGHT	209.855 G.	PELLET WT. STD. D.	.009 G.
ELEMENT LENGTH	34.980 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3520	.3540			
2	3.0	.3530	.3530	.0075		
3	7.0	.3540	.3550	.0090	.012	
4	9.5	.3530	.3520	.0095	.011	.122
5	12.5	.3530	.3530	.0090	.011	.122
6	14.5	.3520	.3530	.0090	.011	
7	18.0	.3530	.3520	.0090	.011	.124
8	20.5	.3500	.3500	.0090	.011	.128
9	22.0	.3530	.3530	.0095	.012	
10	24.5	.3540	.3530	.0075	.012	.127
11	28.5	.3580	.3560	.0065	.009	.125
12	30.0	.3580	.3570	.0055		.120
13	33.5	.3540	.3520			

TABLE F-24. DIMENSIONAL AND PELLET DATA ON ELEMENT D 66

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	16
ROD WEIGHT	139.468 G.	PELLET WEIGHT AVG.	1.350 G.
ELEMENT WEIGHT	210.610 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	34.972 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3520	.3540			
2	3.0	.3530	.3540	.0075		
3	7.0	.3550	.3540	.0090	.008	
4	9.5	.3530	.3530	.0095	.004	.124
5	12.5	.3520	.3530	.0085	.004	.123
6	14.5	.3550	.3540	.0090	.004	
7	18.0	.3530	.3530	.0090	.005	.125
8	20.5	.3530	.3530	.0080	.008	.125
9	22.0	.3550	.3560	.0090	.012	
10	24.5	.3570	.3570	.0070	.015	.124
11	28.5	.3560	.3560	.0070	.015	.123
12	30.0	.3560	.3560	.0070		.117
13	33.5	.3520	.3530			

TABLE F-25. DIMENSIONAL AND PELLET DATA ON ELEMENT D 67

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	9
ROD WEIGHT	139.357 G.	PELLET WEIGHT AVG.	1.364 G.
ELEMENT WEIGHT	210.355 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.958 IN.	PELLET LENGTH AVG.	.574 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3530			
2	3.0	.3530	.3520	.0085		
3	7.0	.3560	.3550	.0085	.011	
4	9.5	.3560	.3560	.0085	.012	.126
5	12.5	.3550	.3560	.0085	.009	.129
6	14.5	.3520	.3530	.0080	.009	
7	18.0	.3510	.3520	.0085	.008	.130
8	20.5	.3490	.3490	.0090	.009	.130
9	22.0	.3530	.3540	.0095	.010	
10	24.5	.3560	.3570	.0055	.009	.130
11	28.5	.3540	.3550	.0075	.015	.130
12	30.0	.3560	.3560	.0065		.126
13	33.5	.3530	.3530			

TABLE F-26. DIMENSIONAL AND PELLET DATA ON ELEMENT D 68

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	29
ROD WEIGHT	140.112 G.	PELLET WEIGHT AVG.	1.352 G.
ELEMENT WEIGHT	210.210 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.981 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3540			
2	3.0	.3530	.3540	.0075		
3	7.0	.3550	.3550	.0090	.005	
4	9.5	.3520	.3540	.0105	.006	.128
5	12.5	.3550	.3560	.0090	.005	.125
6	14.5	.3550	.3560	.0090	.006	
7	18.0	.3560	.3570	.0085	.005	.123
8	21.5	.3550	.3550	.0090	.012	.123
9	22.0	.3550	.3550	.0095	.013	.119
10	24.5	.3570	.3580	.0075	.015	.128
11	28.5	.3560	.3570	.0075	.013	.126
12	30.0	.3570	.3560	.0075		.114
13	33.5	.3530	.3550			

TABLE F-27. DIMENSIONAL AND PELLET DATA ON ELEMENT D 69

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	37
ROD WEIGHT	138.356 G.	PELLET WEIGHT AVG.	1.359 G.
ELEMENT WEIGHT	209.475 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.984 IN.	PELLET LENGTH AVG.	.575 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 9n DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH MAX. IN.	SPACE MIN. IN.
1	1.0	.3530	.3530			
2	3.0	.3540	.3530	.0070		
3	7.0	.3530	.3530	.0090	.013	
4	9.5	.3520	.3530	.0085	.016	.126
5	12.5	.3510	.3520	.0095	.016	.126
6	14.5	.3530	.3520	.0090	.016	.120
7	18.0	.3540	.3520	.0090	.014	.127
8	20.5	.3560	.3560	.0085	.013	.125
9	22.0	.3520	.3530	.0085	.014	
10	24.5	.3520	.3530	.0085	.016	.130
11	28.5	.3530	.3530	.0080	.020	.128
12	30.0	.3540	.3550	.0085		.121
13	33.5	.3520	.3530			

TABLE F-28. DIMENSIONAL AND PELLET DATA ON ELEMENT E 13

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	10
ROD WEIGHT	140.875 G.	PELLET WEIGHT AVG.	1.359 G.
ELEMENT WEIGHT	211.935 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 9n DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH MAX. IN.	SPACE MIN. IN.
1	1.0	.3590	.3600			
2	3.0	.3500	.3540	.0090		
3	7.0	.3500	.3550	.0090	.009	
4	9.5	.3560	.3560	.0095	.012	.123
5	12.5	.3570	.3570	.0085	.017	.125
6	14.5	.3550	.3560	.0085	.017	.115
7	18.0	.3550	.3570	.0085	.021	.126
8	20.5	.3550	.3560	.0080	.018	.124
9	22.0	.3560	.3570	.0090	.017	
10	24.5	.3570	.3570	.0090	.016	.128
11	28.5	.3590	.3580	.0060	.022	.123
12	30.0	.3550	.3560	.0075		.118
13	33.5	.3620	.3610			

TABLE F-29. DIMENSIONAL AND PELLET DATA ON ELEMENT E 22

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	26
ROD WEIGHT	139.996 G.	PELLET WEIGHT AVG.	1.338 G.
ELEMENT WEIGHT	211.160 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.945 IN.	PELLET LENGTH AVG.	.562 IN.
MAX SHEATH DIAM	.663 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER IN. DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3540			
2	3.0	.3530	.3540	.0065		
3	7.0	.3540	.3550	.0085	.006	
4	9.5	.3540	.3580	.0085	.005	.129
5	12.5	.3540	.3580	.0085	.004	.128
6	14.5	.3540	.3570	.0095	.003	.115
7	18.0	.3530	.3560	.0100	.003	.127
8	20.5	.3530	.3550	.0100	.005	.126
9	22.0	.3540	.3570	.0085	.010	
10	24.5	.3550	.3600	.0070	.013	.128
11	29.5	.3550	.3580	.0075	.014	.127
12	30.0	.3560	.3560	.0070		.116
13	33.5	.3530	.3550			

TABLE F-30. DIMENSIONAL AND PELLET DATA ON ELEMENT E 30

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	19
ROD WEIGHT	140.325 G.	PELLET WEIGHT AVG.	1.352 G.
ELEMENT WEIGHT	211.335 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.955 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 9, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER IN. DEG. 90DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3530			
2	3.0	.3530	.3540	.0065		
3	7.0	.3550	.3570	.0085	.009	
4	9.5	.3570	.3560	.0085	.009	.130
5	12.5	.3550	.3550	.0080	.010	.130
6	14.5	.3510	.3530	.0085	.010	.122
7	18.0	.3560	.3560	.0080	.009	.130
8	20.5	.3560	.3560	.0080	.011	.121
9	22.0	.3550	.3560	.0095	.014	.130
10	24.5	.3570	.3570	.0090	.016	.122
11	28.5	.3560	.3550	.0080	.016	.130
12	30.0	.3550	.3550	.0080		.128
13	33.5	.3540	.3530			.123

TABLE F-31. DIMENSIONAL AND PELLET DATA ON ELEMENT E 33

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	24
ROD WEIGHT	140.355 G.	PELLET WEIGHT AVG.	1.345 G.
ELEMENT WEIGHT	211.600 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	34.942 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	SEPT. 8, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90 DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3540	.3520			
2	3.0	.3540	.3530	.0075		
3	7.0	.3530	.3530	.0090	.012	
4	9.5	.3560	.3560	.0085	.014	.123
5	12.5	.3560	.3560	.0085	.015	.127
6	14.5	.3550	.3550	.0085	.013	
7	17.0	.3560	.3560	.0095	.011	.127
8	20.5	.3550	.3560	.0085	.009	.127
9	22.0	.3550	.3570	.0080	.009	
10	24.5	.3570	.3500	.0065	.012	.130
11	28.5	.3560	.3550	.0075	.012	.130
12	30.0	.3560	.3560	.0070		
13	33.5	.3530	.3540			

TABLE F-32. DIMENSIONAL AND PELLET DATA ON ELEMENT E 47

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	41
ROD WEIGHT	139.961 G.	PELLET WEIGHT AVG.	1.350 G.
ELEMENT WEIGHT	211.130 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.969 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.663 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90 DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3630	.3590			
2	3.0	.3530	.3530	.0070		
3	7.0	.3540	.3540	.0085	.021	
4	9.5	.3550	.3550	.0080	.022	-0
5	12.5	.3530	.3540	.0090	.022	-0
6	14.5	.3540	.3560	.0070	.019	
7	18.0	.3560	.3560	.0075	.016	-0
8	20.5	.3530	.3560	.0065	.018	-0
9	22.0	.3540	.3530	.0095	.019	
10	24.5	.3560	.3540	.0085	.025	-0
11	28.5	.3560	.3570	.0060	.021	-0
12	30.0	.3560	.3570	.0065		
13	33.5	.3600	.3610			

TABLE F-33. DIMENSIONAL AND PELLET DATA ON ELEMENT E 49

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	40
ROD WEIGHT	140.622 G.	PELLET WEIGHT AVG.	1.353 G.
ELEMENT WEIGHT	211.720 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.940 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3580	.3600			
2	3.0	.3530	.3530	.0075		
3	7.0	.3540	.3560	.0085	.008	
4	9.5	.3570	.3560	.0090	.005	-0
5	12.5	.3560	.3550	.0080	.002	-0
6	14.5	.3570	.3560	.0075	.001	
7	18.0	.3550	.3570	.0090	.004	-0
8	20.5	.3550	.3560	.0090	.007	-0
9	22.0	.3560	.3580	.0080	.010	
10	24.5	.3580	.3560	.0080	.013	-0
11	28.5	.3550	.3570	.0085	.012	-0
12	30.0	.3550	.3560	.0075		
13	33.5	.3610	.3600			

TABLE F-34. DIMENSIONAL AND PELLET DATA ON ELEMENT E 66

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	42
ROD WEIGHT	140.598 G.	PELLET WEIGHT AVG.	1.357 G.
ELEMENT WEIGHT	211.400 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.961 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3610	.3620			
2	3.0	.3530	.3530	.0075		
3	7.0	.3550	.3570	.0085	.008	
4	9.5	.3540	.3570	.0090	.008	-0
5	12.5	.3560	.3570	.0075	.007	-0
6	14.5	.3530	.3540	.0105	.007	
7	18.0	.3550	.3550	.0095	.007	-0
8	20.5	.3550	.3550	.0095	.011	-0
9	22.0	.3550	.3530	.0100	.015	
10	24.5	.3560	.3540	.0095	.020	-0
11	28.5	.3540	.3580	.0080	.022	-0
12	30.0	.3550	.3550	.0065		
13	33.5	.3630	.3600			

TABLE F-35. DIMENSIONAL AND PELLET DATA ON ELEMENT F 11

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	38
ROD WEIGHT	140.092 G.	PELLET WEIGHT AVG.	1.349 G.
ELEMENT WEIGHT	211.280 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	34.948 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3630	.3630			
2	3.0	.3540	.3530	.0065		
3	7.0	.3570	.3570	.0075	.008	
4	9.5	.3570	.3570	.0075	.009	-0
5	12.5	.3570	.3550	.0085	.010	-0
6	14.5	.3560	.3540	.0080	.010	
7	18.0	.3540	.3560	.0080	.008	-0
8	20.5	.3530	.3550	.0080	.009	-0
9	22.0	.3530	.3540	.0110	.010	
10	24.5	.3540	.3550	.0105	.012	-0
11	28.5	.3550	.3580	.0070	.013	-0
12	30.0	.3560	.3560	.0070		
13	33.5	.3630	.3630			

TABLE F-36. DIMENSIONAL AND PELLET DATA ON ELEMENT F 12

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	14
ROD WEIGHT	140.417 G.	PELLET WEIGHT AVG.	1.346 G.
ELEMENT WEIGHT	211.612 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.968 IN.	PELLET LENGTH AVG.	.566 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3570	.3580			
2	3.0	.3530	.3530	.0070		
3	7.0	.3540	.3570	.0075	.018	
4	9.5	.3550	.3560	.0090	.014	-0
5	12.5	.3540	.3540	.0105	.013	-0
6	14.5	.3560	.3560	.0090	.010	
7	18.0	.3550	.3540	.0100	.006	-0
8	20.5	.3540	.3550	.0095	.003	-0
9	22.0	.3550	.3550	.0090	.002	
10	24.5	.3560	.3550	.0085	.007	-0
11	28.5	.3560	.3560	.0075	.008	-0
12	30.0	.3570	.3570	.0050		
13	33.5	.3620	.3620			

TABLE F-37. DIMENSIONAL AND PELLET DATA ON ELEMENT F 25

TYPE LOADING	8 GRAMS 242PU	PELLET BATCH NO.	39
ROD WEIGHT	140.257 G.	PELLET WEIGHT AVG.	1.351 G.
ELEMENT WEIGHT	211.210 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.931 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	OCT. 19, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3610	.3620			
2	3.0	.3520	.3530	.0075		
3	7.0	.3540	.3570	.0075	.020	
4	9.5	.3550	.3570	.0085	.023	-0 -0
5	12.5	.3540	.3540	.0105	.020	-0 -0
6	14.5	.3540	.3540	.0100	.018	
7	18.0	.3530	.3540	.0110	.016	-0 -0
8	20.5	.3560	.3560	.0080	.017	-0 -0
9	22.0	.3530	.3560	.0085	.018	
10	24.5	.3550	.3560	.0070	.015	-0 -0
11	28.5	.3560	.3550	.0065	.022	-0 -0
12	30.0	.3560	.3560	.0070		
13	33.5	.3610	.3610			

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APPENDIX G

Dimensional Data on Simulated HFIR Target Elements

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TABLE G-1. DIMENSIONAL AND PELLET DATA ON ELEMENT E 11

TYPE LOADING	2.9G.J62 10G.TA	PELLET BATCH NO.	11
ROD WEIGHT	144.814 G.	PELLET WEIGHT AVG.	1.467 g.
ELEMENT WEIGHT	216.925 G.	PELLET WT. STD. D.	.003 g.
ELEMENT LENGTH	34.961 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3530	.3520				
2	3.0	.3520	.3530	.0075			
3	7.0	.3540	.3560	.0095	.006		
4	9.5	.3540	.3560	.0090	.009	-0	-0
5	12.5	.3540	.3560	.0090	.006	-0	-0
6	14.5	.3540	.3560	.0100	.006		
7	18.0	.3550	.3560	.0090	.006	-0	-0
8	20.5	.3550	.3550	.0090	.005	-0	-0
9	22.0	.3540	.3560	.0100	.007		
10	24.5	.3570	.3580	.0070	.010	-0	-0
11	28.5	.3560	.3570	.0070	.018	-0	-0
12	30.0	.3560	.3530	.0075			
13	33.5	.3550	.3540				

TABLE G-2. DIMENSIONAL AND PELLET DATA ON ELEMENT E 12

TYPE LOADING	2.9G.J62 10G.TA	PELLET BATCH NO.	12
ROD WEIGHT	144.510 G.	PELLET WEIGHT AVG.	1.472 g.
ELEMENT WEIGHT	216.495 G.	PELLET WT. STD. D.	.004 g.
ELEMENT LENGTH	34.972 IN.	PELLET LENGTH AVG.	.566 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3520	.3540				
2	3.0	.3540	.3520	.0075			
3	7.0	.3540	.3560	.0085	.015		
4	9.5	.3540	.3560	.0095	.017	-0	-0
5	12.5	.3540	.3570	.0085	.015	-0	-0
6	14.5	.3530	.3570	.0090	.015		
7	18.0	.3540	.3550	.0105	.017	-0	-0
8	20.5	.3540	.3560	.0085	.016	-0	-0
9	22.0	.3530	.3560	.0100	.015		
10	24.5	.3580	.3580	.0065	.015	-0	-0
11	28.5	.3580	.3570	.0065	.020	-0	-0
12	30.0	.3570	.3560	.0035			
13	33.5	.3530	.3530				

TAB E G-3. DIMENSIONAL AND PELLET DATA ON ELEMENT E 14

TYPE LOADING	2.9G.JP2 10G.TA	PELLET BATCH NO.	14
ROD WEIGHT	144.047 G.	PELLET WEIGHT AVG.	1.462 G.
ELEMENT WEIGHT	216.048 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.930 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER		COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE	
		IN.	IN.			MAX. IN.	MIN. IN.
1	1.0	.3520	.3540				
2	3.0	.3540	.3530	.0065			
3	7.0	.3530	.3540	.0095	.030		
4	9.5	.3560	.3560	.0090	.029	-	-0
5	12.5	.3560	.3550	.0085	.028	-0	-0
6	14.5	.3540	.3550	.0085	.028		
7	18.0	.3550	.3550	.0080	.029	-J	-0
8	20.5	.3540	.3530	.0100	.030	-L	-0
9	22.0	.3540	.3530	.0105	.032		
10	24.5	.3580	.3570	.0065	.035	-	-0
11	28.5	.3560	.3560	.0065	.031	-0	-0
12	30.0	.3570	.3570	.0060			
13	33.5	.3540	.3550				

TAB E G-4. DIMENSIONAL AND PELLET DATA ON ELEMENT E 16

TYPE LOADING	2.9G.JP2 10G.TA	PELLET BATCH NO.	16
ROD WEIGHT	144.202 G.	PELLET WEIGHT AVG.	1.459 G.
ELEMENT WEIGHT	216.662 G.	PELLET WT. STD. D.	.247 G.
ELEMENT LENGTH	34.945 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.096 IN.
DATE COMPLETED AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER		COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE	
		IN.	IN.			MAX. IN.	MIN. IN.
1	1.0	.3530	.3530				
2	3.0	.3530	.3540	.0065			
3	7.0	.3560	.3560	.0070	.011		
4	9.5	.3570	.3560	.0100	.019	-0	-0
5	12.5	.3520	.3550	.0105	.019	-L	-0
6	14.5	.3540	.3550	.0110	.019		
7	18.0	.3520	.3540	.0100	.019	-J	-0
8	20.5	.3560	.3550	.0095	.020	-	-0
9	22.0	.3560	.3550	.0110	.020		
10	24.5	.3550	.3570	.0105	.023	-L	-0
11	28.5	.3530	.3570	.0075	.020	-	-0
12	30.0	.3560	.3560	.0095			
13	33.5	.3540	.3520				

TABLE G-5. DIMENSIONAL AND PELLET DATA ON ELEMENT E 17

TYPE LOADING	2.9G, J#2 10G, JA	PELLET BATCH NO.	17
RND WEIGHT	144.619 G.	PELLET WEIGHT AVG.	1.468 g.
ELEMENT WEIGHT	216.931 G.	PELLET WT. STD. D.	.003 g.
ELEMENT LENGTH	34.963 IN.	PELLET LENGTH AVG.	.563 IN.
MAX SHEATH DIAM	.653 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	RND DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.
END	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3521	.3530			
2	3.0	.3541	.3530	.0070		
3	7.0	.3541	.3560	.0085	.007	
4	9.5	.3551	.3560	.0090	.010	-.0
5	12.5	.3551	.3561	.0080	.011	-.0
6	14.5	.3541	.3550	.0085	.010	
7	18.0	.3561	.3560	.0085	.009	-.0
8	20.5	.3551	.3560	.0080	.004	-.0
9	22.0	.3561	.3570	.0080	.004	
10	24.5	.3561	.3590	.0075	.007	-.0
11	28.5	.3561	.3580	.0070	.009	-.0
12	30.0	.3541	.3550	.0075		
13	33.5	.3521	.3530			

TABLE G-6. DIMENSIONAL AND PELLET DATA ON ELEMENT E 18

TYPE LOADING	2.9G, J#2 10G, JA	PELLET BATCH NO.	18
RND WEIGHT	145.707 G.	PELLET WEIGHT AVG.	1.480 g.
ELEMENT WEIGHT	217.363 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.986 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.656 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	RND DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.
END	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3531	.3530			
2	3.0	.3531	.3530	.0080		
3	7.0	.3541	.3550	.0090	.012	
4	9.5	.3561	.3550	.0095	.023	-.0
5	12.5	.3551	.3560	.0095	.022	-.0
6	14.5	.3551	.3560	.0090	.020	
7	18.0	.3550	.3570	.0085	.012	-.0
8	20.5	.3551	.3560	.0085	.011	-.0
9	22.0	.3561	.3560	.0085	.014	
10	24.5	.3571	.3570	.0070	.015	-.0
11	28.5	.3571	.3580	.0055	.008	-.0
12	30.0	.3531	.3560	.0075		
13	33.5	.3511	.3530			

TABLE G-7. DIMENSIONAL AND PELLET DATA ON ELEMENT E 23

TYPE LOADING	2.9G, J62 ING. TA	PELLET BATCH NO.	23
ROD WEIGHT	144.474 G.	PELLET WEIGHT AVG.	1.483 G.
ELEMENT WEIGHT	216.455 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.953 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP_FTFD	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3520				
2	3.0	.3531	.3530	.0070			
3	7.0	.3531	.3530	.0090	.014		
4	9.5	.3541	.3540	.0085	.017	-0	-0
5	12.5	.3531	.3540	.0100	.017	-0	-0
6	14.5	.3531	.3540	.0090	.017		
7	18.0	.3571	.3550	.0085	.013	-0	-0
8	20.5	.3561	.3560	.0080	.015	-0	-0
9	22.0	.3551	.3560	.0095	.016		
10	24.5	.3581	.3571	.0065	.020	-0	-0
11	28.5	.3571	.3570	.0070	.024	-0	-0
12	30.0	.3561	.3560	.0070			
13	33.5	.3531	.3530				

TABLE G-8. DIMENSIONAL AND PELLET DATA ON ELEMENT E 24

TYPE LOADING	2.9G, J62 ING. TA	PELLET BATCH NO.	24
ROD WEIGHT	144.772 G.	PELLET WEIGHT AVG.	1.483 G.
ELEMENT WEIGHT	217.213 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.981 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE CAMP_FTFD	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3520				
2	3.0	.3531	.3520	.0075			
3	7.0	.3521	.3540	.0085	.025		
4	9.5	.3521	.3570	.0095	.024	-0	-0
5	12.5	.3571	.3570	.0085	.022	-0	-0
6	14.5	.3541	.3540	.0090	.020		
7	18.0	.3571	.3560	.0085	.020	-0	-0
8	20.5	.3561	.3560	.0085	.019	-0	-0
9	22.0	.3561	.3560	.0085	.023		
10	24.5	.3581	.3560	.0075	.014	-0	-0
11	28.5	.3581	.3540	.0075	.011	-0	-0
12	30.0	.3561	.3560	.0075			
13	33.5	.3521	.3500				

TABLE G-9. DIMENSIONAL AND PELLET DATA ON ELEMENT E 25

TYPE LOADING	2.9G. J#2 ING. TA	PELLET BATCH NO.	25
ROD WEIGHT	144.899 G.	PELLET WEIGHT AVG.	1.482 g.
ELEMENT WEIGHT	217.230 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.946 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3540				
2	3.0	.3541	.3540	.0060			
3	7.0	.3551	.3550	.0080	.020		
4	9.5	.3551	.3550	.0085	.010	-0	+0
5	12.5	.3551	.3560	.0085	.011	-0	+0
6	14.5	.3561	.3540	.0095	.010		
7	18.0	.3561	.3540	.0085	.012	-0	+0
8	20.5	.3561	.3550	.0085	.011	-0	+0
9	22.0	.3571	.3540	.0085	.009		
10	24.5	.3581	.3570	.0065	.009	-0	+0
11	28.5	.3591	.3580	.0050	.010	-0	+0
12	30.0	.3571	.3560	.0065			
13	33.5	.3521	.3530				

TABLE G-10. DIMENSIONAL AND PELLET DATA ON ELEMENT E 26

TYPE LOADING	2.9G. J#2 ING. TA	PELLET BATCH NO.	3
ROD WEIGHT	144.199 G.	PELLET WEIGHT AVG.	1.475 g.
ELEMENT WEIGHT	216.340 G.	PELLET WT. STD. D.	.004 g.
ELEMENT LENGTH	34.962 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.005 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3530				
2	3.0	.3531	.3530	.0070			
3	7.0	.3551	.3560	.0080	.013		
4	9.5	.3541	.3560	.0085	.009	-0	+0
5	12.5	.3531	.3560	.0085	.009	-0	+0
6	14.5	.3531	.3540	.0095	.008		
7	18.0	.3551	.3560	.0080	.005	-0	+0
8	20.5	.3551	.3550	.0085	.007	-0	+0
9	22.0	.3531	.3560	.0090	.011		
10	24.5	.3541	.3570	.0085	.016	-0	+0
11	28.5	.3561	.3580	.0070	.015	-0	+0
12	30.0	.3551	.3550	.0070			
13	33.5	.3521	.3520				

TABLE G-11. DIMENSIONAL AND PELLET DATA ON ELEMENT E 27

TYPE LOADING	2.9G. J02 ING. TA	PELLET BATCH NO.	27
ROD WEIGHT	144.910 G.	PELLET WEIGHT AVG.	1.477 g.
ELEMENT WEIGHT	217.010 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.961 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.658 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
	NUMBERED	0 DEG.	90 DEG.	TIR	MAX.	MIN.	
	END	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3551	.3530				
2	3.0	.3531	.3540	.0065			
3	7.0	.3541	.3540	.0085	.021		
4	9.5	.3561	.3560	.0085	.023	-0	+0
5	12.5	.3551	.3550	.0085	.022	-0	-0
6	14.5	.3551	.3560	.0090	.022		
7	18.0	.3561	.3560	.0090	.020	-0	-0
8	20.5	.3551	.3550	.0090	.012	-0	+0
9	22.0	.3571	.3560	.0080	.010		
10	24.5	.3571	.3550	.0090	.013	-0	+0
11	28.5	.3561	.3560	.0070	.015	-0	-0
12	30.0	.3571	.3570	.0075			
13	33.5	.3521	.3520				

TABLE G-12. DIMENSIONAL AND PELLET DATA ON ELEMENT E 31

TYPE LOADING	2.9G. J02 ING. TA	PELLET BATCH NO.	31
ROD WEIGHT	144.862 G.	PELLET WEIGHT AVG.	1.479 g.
ELEMENT WEIGHT	217.065 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.965 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.658 IN.	PELLET L. STD. D.	.001 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
	NUMBERED	0 DEG.	90 DEG.	TIR	MAX.	MIN.	
	END	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3541	.3530				
2	3.0	.3541	.3520	.0070			
3	7.0	.3571	.3550	.0090	.020		
4	9.5	.3571	.3550	.0090	.013	-0	+0
5	12.5	.3561	.3560	.0090	.013	-0	-0
6	14.5	.3571	.3570	.0075	.011		
7	18.0	.3571	.3560	.0075	.011	-0	+0
8	20.5	.3561	.3560	.0090	.017	-0	+0
9	22.0	.3561	.3560	.0080	.020		
10	24.5	.3561	.3550	.0075	.017	-0	+0
11	28.5	.3571	.3580	.0050	.007	-0	+0
12	30.0	.3561	.3560	.0070			
13	33.5	.3521	.3520				

TABLE G-13. DIMENSIONAL AND PELLET DATA ON ELEMENT E 37

TYPE LOADING	2.9G, J42 LOG, TA	PELLET BATCH	A, 37
ROD WEIGHT	145.717 G.	PELLET WEIGHT AVG.	1.480 G.
ELEMENT WEIGHT	217.340 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	34.267 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.665 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP_FTFD AUG. 11, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER O DEG. POINTS IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3541	.3520			
2	3.0	.3551	.3531	.0080		
3	7.0	.3541	.3560	.0085	.0121	
4	9.5	.3541	.3561	.0090	.0104	-.0
5	12.5	.3501	.3581	.0065	.0118	-.0
6	14.5	.3551	.3581	.0045	.0112	
7	18.0	.3561	.3571	.0068	.0113	-.0
8	20.5	.3561	.3571	.0075	.0110	-.0
9	22.0	.3561	.3570	.0060	.0096	
10	24.5	.3561	.3591	.0053	.0106	-.0
11	28.5	.3521	.3581	.0055	.0097	-.0
12	31.0	.3571	.3570	.0062		
13	35.5	.3521	.3540			

TABLE G-14. DIMENSIONAL AND PELLET DATA ON ELEMENT E 39

TYPE LOADING	2.9G, J42 LOG, TA	PELLET BATCH	A, 39
ROD WEIGHT	145.032 G.	PELLET WEIGHT AVG.	1.475 G.
ELEMENT WEIGHT	217.382 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.940 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE CAMP_FTFD AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER O DEG. POINTS IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3521	.3530			
2	3.0	.3531	.3530	.0070		
3	7.0	.3520	.3580	.0090	.014	
4	9.5	.3541	.3570	.0090	.016	-.0
5	12.5	.3541	.3520	.0090	.016	-.0
6	14.5	.3511	.3570	.0080	.018	
7	18.0	.3521	.3570	.0085	.018	-.0
8	20.5	.3561	.3570	.0075	.018	-.0
9	22.0	.3551	.3560	.0065	.018	
10	24.5	.3561	.3600	.0060	.019	-.0
11	28.5	.3571	.3580	.0060	.015	-.0
12	30.0	.3531	.3550	.0080		
13	33.5	.3531	.3550			

TAB E G-15. DIMENSIONAL AND PELLET DATA ON ELEMENT E 40

TYPE LOADING	2.9G.J32 10G.IA	PELLET BATCH NO.	7
ROD WEIGHT	143.824 G.	PELLET WEIGHT AVG.	1.475 G.
ELEMENT WEIGHT	216.148 G.	PELLET WT. STD. D.	.0003
ELEMENT LENGTH	34.964 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.652 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP_FTRD AUG.13,1965			

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
	NUMBERED	IN. DEG. 90DEG.		TIR	MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3531	.3530			
2	3.0	.3527	.3540	.0070		
3	7.0	.3531	.3530	.0095	.024	
4	9.5	.3527	.3510	.0100	.027	-0 -0
5	12.5	.3517	.3510	.0100	.023	-0 -0
6	14.5	.3527	.3510	.0085	.023	
7	18.0	.3527	.3530	.0100	.022	-0 -0
8	20.5	.3531	.3530	.0075	.018	-0 -0
9	22.0	.3541	.3530	.0100	.017	
10	24.5	.3567	.3560	.0080	.018	-0 -0
11	28.5	.3547	.3540	.0070	.015	-0 -0
12	30.0	.3567	.3560	.0070		
13	33.5	.3531	.3520			

TAB E G-16. DIMENSIONAL AND PELLET DATA ON ELEMENT E 43

TYPE LOADING	2.9G.J32 10G.IA	PELLET BATCH NO.	8
ROD WEIGHT	145.541 G.	PELLET WEIGHT AVG.	1.473 G.
ELEMENT WEIGHT	216.565 G.	PELLET WT. STD. D.	.0043
ELEMENT LENGTH	34.961 IN.	PELLET LENGTH AVG.	.573 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE CAMP_FTRD AUG.13,1965			

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
	NUMBERED	IN. DEG. 90DEG.		TIR	MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3531	.3540			
2	3.0	.3540	.3540	.0045		
3	7.0	.3531	.3540	.0045	.034	
4	9.5	.3551	.3550	.0080	.035	-0 -0
5	12.5	.3537	.3550	.0085	.030	-0 -0
6	14.5	.3561	.3560	.0095	.025	
7	18.0	.3561	.3540	.0085	.011	-0 -0
8	20.5	.3551	.3550	.0080	.009	-0 -0
9	22.0	.3561	.3560	.0090	.011	
10	24.5	.3571	.3550	.0085	.014	-0 -0
11	28.5	.3561	.3570	.0075	.011	-0 -0
12	30.0	.3551	.3560	.0065		
13	33.5	.3521	.3530			

TAB F G-17. DIMENSIONAL AND PELLET DATA ON ELEMENT F 44

TYPE LOADING	2.0G. JF2 10G. TA	PELLET BATCH NO.	9
ROD WEIGHT	144.619 G.	PELLET WEIGHT AVG.	1.473 g.
ELEMENT WEIGHT	216.935 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.938 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.002 IN.
DATE COMP. FTED	AUG. 13, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN. IN.	IN.	IN.	IN. IN.
1	1.0	.3541	.3520		
2	3.0	.3531	.3530	.0070	
3	7.0	.3541	.3550	.0100	.010
4	9.5	.3531	.3550	.0115	.007 -0 -0
5	12.5	.3541	.3540	.0110	.007 -0 -0
6	14.5	.3531	.3550	.0105	.005
7	18.0	.3531	.3560	.0100	.005 -0 -0
8	20.5	.3531	.3560	.0095	.008 -0 -0
9	22.0	.3541	.3560	.0100	.014
10	24.5	.3531	.3580	.0095	.014 -0 -0
11	28.5	.3571	.3580	.0075	.010 -0 -0
12	30.0	.3531	.3560	.0075	
13	33.5	.3531	.3520		

TAB E G-18. DIMENSIONAL AND PELLET DATA ON ELEMENT F 45

TYPE LOADING	2.9G. JF2 10G. TA	PELLET BATCH NO.	10
ROD WEIGHT	144.725 G.	PELLET WEIGHT AVG.	1.471 g.
ELEMENT WEIGHT	216.815 G.	PELLET WT. STD. D.	.004 g.
ELEMENT LENGTH	34.968 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.658 IN.	PELLET L. STD. D.	.001 IN.
DATE COMP. FTED	AUG. 13, 1965		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN. IN.	IN.	IN.	IN. IN.
1	1.0	.3531	.3530		
2	3.0	.3531	.3530	.0070	
3	7.0	.3541	.3550	.0085	.020
4	9.5	.3571	.3560	.0085	.016 -0 -0
5	12.5	.3551	.3560	.0080	.015 -0 -0
6	14.5	.3531	.3560	.0095	.016
7	18.0	.3531	.3560	.0095	.015 -0 -0
8	20.5	.3531	.3540	.0090	.017 -0 -0
9	22.0	.3561	.3550	.0095	.017
10	24.5	.3581	.3560	.0080	.021 -0 -0
11	28.5	.3571	.3570	.0070	.030 -0 -0
12	30.0	.3571	.3560	.0070	
13	33.5	.3521	.3500		

TABLE G-19. DIMENSIONAL AND PELLET DATA ON ELEMENT E 48

TYPE LOADING	2.9G.JM2 10G.TA	PELLET BATCH NO.	35
ROD WEIGHT	144.672 G.	PELLET WEIGHT AVG.	1.472 g.
ELEMENT WEIGHT	216.685 G.	PELLET WT. STD. D.	.003 g.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP. ETCD	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
	NUMBERED	0 DEG. 90 DEG.		TIR	MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3531	.3520			
2	3.0	.3531	.3530	.0070		
3	7.0	.3531	.3560	.0080	.013	
4	9.5	.3551	.3560	.0085	.015	-0
5	12.5	.3570	.3540	.0085	.013	-0
6	14.5	.3561	.3540	.0085	.011	
7	18.0	.3551	.3550	.0070	.010	-0
8	20.5	.3561	.3550	.0085	.005	-0
9	22.0	.3551	.3550	.0085	.005	
10	24.5	.3590	.3570	.0070	.005	-0
11	28.5	.3580	.3570	.0065	.006	-0
12	30.0	.3561	.3550	.0065		
13	33.5	.3541	.3530			

TABLE G-20. DIMENSIONAL AND PELLET DATA ON ELEMENT E 50

TYPE LOADING	2.9G.JM2 10G.TA	PELLET BATCH NO.	36
ROD WEIGHT	144.829 G.	PELLET WEIGHT AVG.	1.476 g.
ELEMENT WEIGHT	217.190 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.935 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP. ETCD	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE	
	NUMBERED	0 DEG. 90 DEG.		TIR	MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3531	.3530			
2	3.0	.3521	.3540	.0080		
3	7.0	.3550	.3570	.0080	.015	
4	9.5	.3560	.3560	.0090	.013	-0
5	12.5	.3551	.3560	.0090	.012	-0
6	14.5	.3541	.3570	.0085	.012	
7	18.0	.3541	.3570	.0100	.014	-0
8	20.5	.3561	.3560	.0090	.011	-0
9	22.0	.3561	.3560	.0085	.008	
10	24.5	.3571	.3590	.0070	.008	-0
11	28.5	.3581	.3580	.0065	.011	-0
12	30.0	.3541	.3550	.0075		
13	33.5	.3551	.3550			

TABLE G-21. DIMENSIONAL AND PELLET DATA ON ELEMENT E 70

TYPE LOADING	2.9G.JP2 10G.TA	PELLET BATCH NO.	4
ROD WEIGHT	145.578 G.	PELLET WEIGHT AVG.	1.475 G.
ELEMENT WEIGHT	216.680 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.932 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3520				
2	3.0	.3540	.3530	.0070			
3	7.0	.3550	.3560	.0080	.017		
4	9.5	.3540	.3560	.0080	.012	-0	-0
5	12.5	.3540	.3560	.0085	.010	-0	-0
6	14.5	.3560	.3550	.0090	.010		
7	18.0	.3550	.3560	.0090	.005		-0
8	20.5	.3550	.3560	.0080	.004	-0	-0
9	22.0	.3540	.3560	.0085	.004		
10	24.5	.3550	.3560	.0080	.014	-0	-0
11	28.5	.3580	.3570	.0070	.010	-0	-0
12	30.0	.3570	.3560	.0065			
13	33.5	.3520	.3520				

TABLE G-22. DIMENSIONAL AND PELLET DATA ON ELEMENT F 13

TYPE LOADING	2.9G.JP2 10G.TA	PELLET BATCH NO.	13
ROD WEIGHT	144.630 G.	PELLET WEIGHT AVG.	1.467 G.
ELEMENT WEIGHT	216.903 G.	PELLET WT. STD. D.	.006 G.
ELEMENT LENGTH	34.950 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90 DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3530	.3530				
2	3.0	.3530	.3530	.0070			
3	7.0	.3530	.3570	.0085	.018		
4	9.5	.3550	.3570	.0095	.017	-0	-0
5	12.5	.3560	.3570	.0080	.013	-0	-0
6	14.5	.3530	.3560	.0085	.011		
7	18.0	.3530	.3560	.0105	.010	-0	-0
8	20.5	.3530	.3560	.0090	.016	-0	-0
9	22.0	.3530	.3570	.0105	.021		
10	24.5	.3570	.3600	.0070	.028	-0	-0
11	28.5	.3560	.3590	.0070	.022	-0	-0
12	30.0	.3560	.3570	.0075			
13	33.5	.3520	.3570				

TABLE G-23. DIMENSIONAL AND PELLET DATA ON ELEMENT F 15

TYPE LOADING	2.9G J02 ING. TA	PELLET BATCH NO.	15
ROD WEIGHT	144.039 G.	PELLET WEIGHT AVG.	1.457 G.
ELEMENT WEIGHT	216.393 G.	PELLET WT. STD. D.	.0043 G.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM.	.652 IN.	PELLET L. STD. D.	.003 IN.
DATE CAMP. FTED AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3540	.3530			
2	3.0	.3540	.3530	.0075		
3	7.0	.3550	.3550	.0090	.022	
4	9.5	.3560	.3540	.0090	.017	-0
5	12.5	.3560	.3550	.0080	.015	-0
6	14.5	.3540	.3560	.0090	.015	
7	18.0	.3560	.3560	.0085	.019	-0
8	20.5	.3540	.3540	.0105	.021	-0
9	22.0	.3540	.3560	.0080	.020	
10	24.5	.3570	.3570	.0070	.021	-0
11	28.5	.3570	.3570	.0065	.019	-0
12	30.0	.3530	.3540	.0095		
13	33.5	.3540	.3540			

TABLE G-24. DIMENSIONAL AND PELLET DATA ON ELEMENT F 16

TYPE LOADING	2.9G J02 ING. TA	PELLET BATCH NO.	1
ROD WEIGHT	144.807 G.	PELLET WEIGHT AVG.	1.475 G.
ELEMENT WEIGHT	217.200 G.	PELLET WT. STD. D.	.0033 G.
ELEMENT LENGTH	34.954 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM.	.660 IN.	PELLET L. STD. D.	.003 IN.
DATE CAMP. FTED AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3530			
2	3.0	.3530	.3530	.0070		
3	7.0	.3540	.3550	.0095	.014	
4	9.5	.3560	.3560	.0100	.015	-0
5	12.5	.3550	.3550	.0080	.015	-0
6	14.5	.3530	.3560	.0090	.015	
7	18.0	.3560	.3560	.0090	.014	-0
8	20.5	.3560	.3560	.0085	.013	-0
9	22.0	.3570	.3560	.0075	.013	
10	24.5	.3590	.3580	.0060	.012	-0
11	28.5	.3560	.3570	.0075	.020	-0
12	30.0	.3570	.3560	.0065		
13	33.5	.3540	.3530			

TABLE G-25. DIMENSIONAL AND PELLET DATA ON ELEMENT F 19

TYPE LOADING	2.9G.J#2 10G.TA	PELLET BATCH NO.	19
ROD WEIGHT	145.129 G.	PELLET WEIGHT AVG.	1.481 G.
ELEMENT WEIGHT	217.605 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.972 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE
NUMBERED	IN. FROM	IN. FROM	IN. FROM	TIR	MAX. MIN.
END	IN.	IN.	IN.	IN.	IN. IN.
1	1.0	.3531	.3530		
2	3.0	.3531	.3540	.0065	
3	7.0	.3540	.3560	.0095	.008
4	9.5	.3541	.3560	.0095	.012 -0 -0
5	12.5	.3561	.3570	.0085	.007 -0 -0
6	14.5	.3570	.3560	.0060	.007
7	18.0	.3571	.3560	.0065	.007 -0 -0
8	20.5	.3571	.3570	.0065	.004 -0 -0
9	22.0	.3571	.3560	.0065	.004
10	24.5	.3581	.3560	.0065	.005 -0 -0
11	28.5	.3581	.3570	.0065	.008 -0 -0
12	30.0	.3570	.3570	.0055	
13	33.5	.3541	.3540		

TABLE G-26. DIMENSIONAL AND PELLET DATA ON ELEMENT F 21

TYPE LOADING	2.9G.J#2 10G.TA	PELLET BATCH NO.	21
ROD WEIGHT	144.881 G.	PELLET WEIGHT AVG.	1.477 G.
ELEMENT WEIGHT	217.325 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	34.952 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE
NUMBERED	IN. FROM	IN. FROM	IN. FROM	TIR	MAX. MIN.
END	IN.	IN.	IN.	IN.	IN. IN.
1	1.0	.3531	.3530		
2	3.0	.3531	.3530	.0070	
3	7.0	.3540	.3560	.0090	.012
4	9.5	.3541	.3550	.0100	.017 -0 -0
5	12.5	.3551	.3560	.0085	.012 -0 -0
6	14.5	.3531	.3530	.0100	.009
7	18.0	.3530	.3530	.0110	.008 -0 -0
8	20.5	.3541	.3530	.0110	.012 -0 -0
9	22.0	.3541	.3520	.0110	.010
10	24.5	.3561	.3560	.0080	.007 -0 -0
11	28.5	.3571	.3560	.0065	.010 -0 -0
12	30.0	.3561	.3550	.0075	
13	33.5	.3541	.3520		

TABLE G-27. DIMENSIONAL AND PELLET DATA ON ELEMENT F 22

TYPE LOADING	2.9G.JM2 10G.TA	PELLET BATCH NO.	22
ROD WEIGHT	144.853 G.	PELLET WEIGHT AVG.	1.480 3%
ELEMENT WEIGHT	217.370 G.	PELLET WT. STD. D.	.005 3%
ELEMENT LENGTH	34.945 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.004 IN.
DATE COMPLETED	AUG.13,1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3521	.3530				
2	3.0	.3541	.3520	.0070			
3	7.0	.3571	.3540	.0085	.021		
4	9.5	.3560	.3540	.0090	.025	-0	+0
5	12.5	.3541	.3540	.0110	.024	-0	-0
6	14.5	.3550	.3550	.0085	.022		
7	18.0	.3541	.3540	.0105	.012	-0	+0
8	20.5	.3560	.3540	.0095	.009	-0	-0
9	22.0	.3561	.3551	.0085	.013		
10	24.5	.3590	.3560	.0075	.020	-0	+0
11	28.5	.3581	.3560	.0080	.017	-0	-0
12	30.0	.3550	.3540	.0085			
13	33.5	.3531	.3520				

TABLE G-28. DIMENSIONAL AND PELLET DATA ON ELEMENT F 26

TYPE LOADING	2.9G.JM2 10G.TA	PELLET BATCH NO.	26
ROD WEIGHT	144.351 G.	PELLET WEIGHT AVG.	1.478 3%
ELEMENT WEIGHT	216.470 G.	PELLET WT. STD. D.	.001 3%
ELEMENT LENGTH	34.946 IN.	PELLET LENGTH AVG.	.566 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG.13,1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG.	90DEG.		TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3541	.3520				
2	3.0	.3531	.3530	.0070			
3	7.0	.3521	.3520	.0100	.009		
4	9.5	.3561	.3560	.0085	.007	-0	+0
5	12.5	.3551	.3550	.0090	.005	-0	+0
6	14.5	.3531	.3530	.0090	.005		
7	18.0	.3561	.3560	.0075	.004	-0	+0
8	20.5	.3561	.3560	.0070	.003	-0	-0
9	22.0	.3541	.3550	.0090	.005		
10	24.5	.3581	.3580	.0060	.005	-0	+0
11	28.5	.3550	.3550	.0085	.008	-0	-0
12	30.0	.3551	.3550	.0060			
13	33.5	.3531	.3520				

TABLE G-29. DIMENSIONAL AND PELLET DATA ON ELEMENT F 28

TYPE LOADING	2.9G, J92 10G, TA	PELLET BATCH NO.	28
ROD WEIGHT	144.787 G.	PELLET WEIGHT AVG.	1.478 g.
ELEMENT WEIGHT	216.813 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.95" IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3531	.3530				
2	3.0	.3531	.3551	.0065			
3	7.0	.3541	.3550	.0085	.007		
4	9.5	.3551	.3560	.0085	.005	-0	-0
5	12.5	.3541	.3541	.0080	.004	-0	-0
6	14.5	.3521	.3530	.0090	.003		
7	18.0	.3561	.3560	.0085	.003	-0	-0
8	21.5	.3541	.3550	.0090	.006	-0	-0
9	22.0	.3531	.3550	.0095	.009		
10	24.5	.3561	.3580	.0075	.015	-0	-0
11	28.5	.3551	.3570	.0070	.012	-0	-0
12	31.0	.3561	.3560	.0065			
13	33.5	.3541	.3540				

TABLE G-30. DIMENSIONAL AND PELLET DATA ON ELEMENT F 29

TYPE LOADING	2.9G, J92 10G, TA	PELLET BATCH NO.	29
ROD WEIGHT	144.974 G.	PELLET WEIGHT AVG.	1.477 g.
ELEMENT WEIGHT	217.352 G.	PELLET WT. STD. D.	.002 g.
ELEMENT LENGTH	34.94" IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	IN.	IN.	IN.	TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3531	.3540				
2	3.0	.3530	.3540	.0070			
3	7.0	.3521	.3550	.0075	.021		
4	9.5	.3550	.3560	.0090	.020	-0	-0
5	12.5	.3561	.3570	.0090	.023	-0	-0
6	14.5	.3551	.3560	.0085	.022		
7	18.0	.3561	.3570	.0075	.018	-0	-0
8	21.5	.3541	.3550	.0095	.018	-0	-0
9	22.0	.3561	.3560	.0090	.021		
10	24.5	.3581	.3570	.0075	.023	-0	-0
11	28.5	.3531	.3580	.0070	.023	-0	-0
12	31.0	.3561	.3560	.0080			
13	33.5	.3531	.3530				

TAB E G-31. DIMENSIONAL AND PELLET DATA ON ELEMENT F 30

TYPE LOADING	2.9G, J02 10G, TA	PELLET BATCH NO.	30
RND WEIGHT	145.142 G.	PELLET WEIGHT AVG.	1.476 G.
ELEMENT WEIGHT	217.415 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.944 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP_FTFD	AUG. 13, 1965		

POSITION	IN. FROM	RND DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
	NUMBERED	IN. DEG. 90 DEG.		TIR	MAX.	MIN.	
	END	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3521	.3540				
2	3.0	.3521	.3530	.0075			
3	7.0	.3561	.3560	.0085	.022		
4	9.5	.3571	.3560	.0090	.016	-L	-0
5	12.5	.3561	.3550	.0085	.017	-U	-0
6	14.5	.3551	.3560	.0080	.017		
7	18.0	.3561	.3570	.0085	.016	-U	-0
8	20.5	.3550	.3570	.0080	.016	-U	-0
9	22.0	.3551	.3570	.0090	.016		
10	24.5	.3571	.3570	.0080	.020	-0	-0
11	28.5	.3571	.3580	.0075	.024	-U	-0
12	30.0	.3551	.3560	.0080			
13	33.5	.3540	.3530				

TAB E G-32. DIMENSIONAL AND PELLET DATA ON ELEMENT F 31

TYPE LOADING	2.9G, J02 10G, TA	PELLET BATCH NO.	6
RND WEIGHT	144.427 G.	PELLET WEIGHT AVG.	1.476 G.
ELEMENT WEIGHT	216.515 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.940 IN.	PELLET LENGTH AVG.	.567 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE CAMP_FTFD	AUG. 13, 1965		

POSITION	IN. FROM	RND DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
	NUMBERED	IN. DEG. 90 DEG.		TIR	MAX.	MIN.	
	END	IN.	IN.	IN.	IN.	IN.	
1	1.0	.3531	.3530				
2	3.0	.3540	.3530	.0065			
3	7.0	.3531	.3540	.0065	.022		
4	9.5	.3571	.3560	.0080	.024	-U	-0
5	12.5	.3561	.3560	.0080	.020	-U	-0
6	14.5	.3551	.3530	.0070	.016		
7	18.0	.3550	.3560	.0080	.013	-L	-0
8	20.5	.3550	.3540	.0065	.010	-L	-0
9	22.0	.3561	.3530	.0075	.011		
10	24.5	.3540	.3550	.0085	.010	-L	-0
11	28.5	.3561	.3570	.0065	.011	-L	-0
12	30.0	.3570	.3550	.0065			
13	33.5	.3550	.3530				

TAB E G-33. DIMENSIONAL AND PELLET DATA ON ELEMENT F 32

TYPE LOADING	2.9G. J02 10G. TA	PELLET HATCH N.	32
ROD WEIGHT	145.277 G.	PELLET WEIGHT AVG.	1.482 G.
ELEMENT WEIGHT	217.70 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.941 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE (CMP_FTE) AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER N DEG. 90 DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3530			
2	5.0	.3530	.3530	.0071		
3	7.0	.3570	.3560	.0085	.118	
4	9.5	.3560	.3560	.0090	.008	-0
5	12.5	.3530	.3550	.0100	.007	-0
6	14.5	.3540	.3540	.0100	.007	
7	16.0	.3560	.3560	.0100	.111	-0
8	20.5	.3540	.3550	.0105	.117	-0
9	22.0	.3560	.3560	.0085	.123	
10	24.5	.3530	.3580	.0070	.129	-0
11	28.5	.3530	.3580	.0070	.125	-0
12	30.0	.3570	.3560	.0065		
13	33.5	.3540	.3540			

TAB - G-34. DIMENSIONAL AND PELLET DATA ON ELEMENT F 33

TYPE LOADING	2.9G. J02 10G. TA	PELLET HATCH N.	33
ROD WEIGHT	145.141 G.	PELLET WEIGHT AVG.	1.479 G.
ELEMENT WEIGHT	217.415 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.965 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE (CMP_FTE) AUG. 13, 1965			

POSITION	IN. FROM NUMBERED END	ROD DIAMETER N DEG. 90 DEG. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. IN.	MIN. IN.
1	1.0	.3530	.3530			
2	5.0	.3530	.3530	.0070		
3	7.0	.3550	.3560	.0090	.015	
4	9.5	.3560	.3570	.0085	.016	-0
5	12.5	.3560	.3570	.0090	.015	-0
6	14.5	.3560	.3560	.0100	.015	
7	16.0	.3570	.3560	.0090	.114	-0
8	20.5	.3560	.3540	.0095	.008	-0
9	22.0	.3570	.3540	.0095	.004	
10	24.5	.3580	.3550	.0075	.004	-0
11	28.5	.3580	.3560	.0075	.018	-0
12	30.0	.3550	.3550	.0080		
13	33.5	.3510	.3520			

TABLE G-35. DIMENSIONAL AND PELLET DATA ON ELEMENT F 34

TYPE LOADING	2.9G, J42 LOG, TA	PELLET BATCH NO.	34
ROD WEIGHT	144.939 G.	PELLET WEIGHT AVG.	1.475 G.
ELEMENT WEIGHT	217.285 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.948 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG. 90 DEG.			TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3530				
2	3.0	.3530	.3540	.0075			
3	7.0	.3560	.3560	.0085	.121		
4	9.5	.3550	.3560	.0090	.121	-0	-0
5	12.5	.3560	.3560	.0085	.119	-0	-0
6	14.5	.3550	.3560	.0085	.120		
7	18.0	.3540	.3560	.0100	.119	-0	-0
8	20.5	.3550	.3560	.0095	.121	-0	-0
9	22.0	.3530	.3560	.0090	.122		
10	24.5	.3590	.3580	.0065	.122	-0	-0
11	26.5	.3590	.3580	.0060	.121	-0	-0
12	30.0	.3570	.3560	.0070			
13	33.5	.3560	.3540				

TABLE G-36. DIMENSIONAL AND PELLET DATA ON ELEMENT F 40

TYPE LOADING	2.9G, J42 LOG, TA	PELLET BATCH NO.	40
ROD WEIGHT	145.771 G.	PELLET WEIGHT AVG.	1.484 G.
ELEMENT WEIGHT	217.135 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.970 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.662 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE		
NUMBERED	0 DEG. 90 DEG.			TIR	MAX.	MIN.	
END	IN.	IN.	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3530				
2	3.0	.3530	.3530	.0070			
3	7.0	.3540	.3550	.0100	.009		
4	9.5	.3550	.3550	.0100	.012	-0	-0
5	12.5	.3570	.3530	.0085	.011	-0	-0
6	14.5	.3560	.3540	.0085	.009		
7	18.0	.3560	.3540	.0090	.009	-0	-0
8	20.5	.3560	.3530	.0095	.111	-0	-0
9	22.0	.3550	.3540	.0100	.011		
10	24.5	.3570	.3570	.0075	.011	-0	-0
11	26.5	.3590	.3560	.0065	.009	-0	-0
12	30.0	.3570	.3560	.0045			
13	33.5	.3530	.3530				

TABLE G-37. DIMENSIONAL AND PELLET DATA ON ELEMENT F 60

TYPE LOADING	2.9G, J02 ING. TA	PELLET BATCH NO.	38
ROD WEIGHT	144.345 G.	PELLET WEIGHT AVG.	1.483 G.
ELEMENT WEIGHT	216.410 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.002 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE
NUMBERED	0 DEG.	90 DEG.		TIR	MAX. MIN.
END	IN.	IN.	IN.	IN.	IN. IN.
1	1.0	.3530	.3530		
2	3.0	.3530	.3530	.0075	
3	7.0	.3540	.3560	.0095	.015
4	9.5	.3540	.3540	.0100	.012
5	12.5	.3540	.3530	.0115	.011
6	14.5	.3520	.3530	.0120	.011
7	18.0	.3520	.3550	.0115	.011
8	20.5	.3560	.3560	.0095	.012
9	22.0	.3560	.3560	.0090	.016
10	24.5	.3560	.3580	.0070	.020
11	28.5	.3570	.3570	.0070	.022
12	30.0	.3560	.3550	.0085	
13	33.5	.3530	.3520		

TABLE G-38. DIMENSIONAL AND PELLET DATA ON ELEMENT F 70

TYPE LOADING	2.9G, J02 ING. TA	PELLET BATCH NO.	5
ROD WEIGHT	144.400 G.	PELLET WEIGHT AVG.	1.473 G.
ELEMENT WEIGHT	216.700 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	34.960 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.003 IN.
DATE COMPLETED	AUG. 13, 1965		

POSITION	IN. FROM	ROD DIAMETER	COLLAPSE	SHEATH	SHEATH SPACE
NUMBERED	0 DEG.	90 DEG.		TIR	MAX. MIN.
END	IN.	IN.	IN.	IN.	IN. IN.
1	1.0	.3540	.3520		
2	3.0	.3530	.3560	.0065	
3	7.0	.3540	.3560	.0085	.017
4	9.5	.3540	.3550	.0095	.009
5	12.5	.3520	.3560	.0095	.008
6	14.5	.3540	.3540	.0095	.007
7	18.0	.3540	.3550	.0090	.008
8	20.5	.3530	.3540	.0095	.006
9	22.0	.3520	.3530	.0115	.010
10	24.5	.3550	.3560	.0080	.017
11	28.5	.3560	.3570	.0060	.010
12	30.0	.3550	.3560	.0065	
13	33.5	.3520	.3550

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APPENDIX H

Dimensional Data on SRL-HFIR Target Elements

TABLE H-1. DIMENSIONAL AND PELLET DATA ON ELEMENT A 06

TYPE LEADING	10G. 242PU	PELLET BATCH NO.	8
ROD WEIGHT	142.660 G.	PELLET WEIGHT AVG.	1.406 G.
ELEMENT WEIGHT	213.525 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.560 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.009 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3534	.3530			
2	3.0	.3540	.3525	.0073		
3	7.0	.3565	.3565	.0070	.006	
4	9.5	.3572	.3568	.0074	.005	.120
5	12.5	.3565	.3580	.0070	.004	.121
6	14.5	.3545	.3558	.0081	.006	.116
7	18.0	.3563	.3568	.0072	.009	.123
8	20.5	.3555	.3563	.0082	.009	.122
9	22.0	.3570	.3563	.0085	.010	
10	24.5	.3573	.3583	.0071	.011	.127
11	28.5	.3581	.3571	.0063	.012	.120
12	30.0	.3535	.3540	.0068		.114
13	33.5	.3528	.3532			

TABLE H-2. DIMENSIONAL AND PELLET DATA ON ELEMENT A 10

TYPE LEADING	10G. 242PU	PELLET BATCH NO.	17
ROD WEIGHT	142.003 G.	PELLET WEIGHT AVG.	1.406 G.
ELEMENT WEIGHT	212.730 G.	PELLET WT. STD. D.	.015 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3520	.3520			
2	3.0	.3530	.3530	.0072		
3	7.0	.3545	.3555	.0089	.003	
4	9.5	.3563	.3557	.0076	.004	.126
5	12.5	.3563	.3550	.0089	.006	.123
6	14.5	.3520	.3550	.0090	.007	
7	18.0	.3540	.3553	.0080	.010	.128
8	20.5	.3548	.3555	.0092	.012	.126
9	22.0	.3545	.3560	.0091	.018	
10	24.5	.3553	.3570	.0082	.020	.128
11	28.5	.3562	.3570	.0054	.023	.125
12	30.0	.3530	.3540	.0075		.116
13	33.5	.3532	.3510			

TABLE H-3. DIMENSIONAL AND PELLET DATA ON ELEMENT A 11

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	14
ROD WEIGHT	141.450 G.	PELLET WEIGHT AVG.	1.407 G.
ELEMENT WEIGHT	212.205 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.007 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3520 .3525			
2	3.0	.3522 .3522	.0073		
3	7.0	.3550 .3540	.0087	.030	
4	9.5	.3568 .3550	.0086	.026	.124 .116
5	12.5	.3553 .3543	.0091	.024	.123 .117
6	14.5	.3511 .3547	.0094	.021	
7	18.0	.3555 .3545	.0087	.019	.124 .117
8	20.5	.3550 .3528	.0082	.021	.125 .114
9	22.0	.3530 .3533	.0098	.023	
10	24.5	.3548 .3555	.0084	.023	.126 .116
11	28.5	.3560 .3570	.0065	.023	.124 .115
12	30.0	.3535 .3535	.0070		
13	33.5	.3535 .3510			

TABLE H-4. DIMENSIONAL AND PELLET DATA ON ELEMENT A 13

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	18
ROD WEIGHT	142.130 G.	PELLET WEIGHT AVG.	1.407 G.
ELEMENT WEIGHT	212.955 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.010 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED END	ROD DIAMETER n DEG. 90DEG. IN. IN.	COLLAPSE IN.	SHEATH TIR IN.	SHEATH SPACE MAX. MIN. IN. IN.
1	1.0	.3540 .3525			
2	3.0	.3532 .3522	.0067		
3	7.0	.3547 .3550	.0093	.030	
4	9.5	.3568 .3552	.0083	.025	.121 .117
5	12.5	.3562 .3553	.0086	.019	.125 .118
6	14.5	.3545 .3547	.0102	.018	
7	18.0	.3540 .3548	.0109	.015	.130 .118
8	20.5	.3537 .3565	.0096	.014	.125 .122
9	22.0	.3540 .3562	.0098	.010	
10	24.5	.3578 .3572	.0076	.010	.126 .120
11	28.5	.3583 .3570	.0065	.010	.125 .122
12	30.0	.3535 .3520	.0074		
13	33.5	.3530 .3530			

TABLE H-5. DIMENSIONAL AND PELLET DATA ON ELEMENT A 18

TYPE LOADING	10G. 242PU	PELLFT BATCH NM.	16
ROD WEIGHT	142.170 G.	PELLFT WEIGHT AVG.	1.407 G.
FLMMENT WEIGHT	212.725 G.	PELLFT WT. STD. D.	.000 G.
FLMMENT LENGTH	35.000 IN.	PELLFT LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.661 IN.	PELLFT L. STD. D.	.010 IN.
DATE COMPLETED	DEC.22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN.	IN.	IN.	IN. IN.
1	1.0	.3514	.3525		
2	3.0	.3515	.3528	.0073	
3	7.0	.3545	.3560	.0085	.016
4	9.5	.3550	.3560	.0090	.014 .122 .117
5	12.5	.3558	.3562	.0087	.012 .123 .117
6	14.5	.3555	.3553	.0088	.010
7	18.0	.3563	.3552	.0045	.009 .123 .118
8	20.5	.3550	.3550	.0087	.010 .127 .115
9	22.0	.3558	.3553	.0087	.012
10	24.5	.3575	.3560	.0077	.012 .124 .118
11	28.5	.3560	.3583	.0071	.012 .124 .120
12	30.0	.3520	.3540	.0075	
13	33.5	.3500	.3530		

TABLE H-6. DIMENSIONAL AND PELLET DATA ON ELEMENT A 31

TYPE LOADING	10G. 242PU	PELLFT BATCH NM.	13
ROD WEIGHT	142.160 G.	PELLFT WEIGHT AVG.	1.410 G.
FLMMENT WEIGHT	212.970 G.	PELLFT WT. STD. D.	.008 G.
FLMMENT LENGTH	35.000 IN.	PELLFT LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.660 IN.	PELLFT L. STD. D.	.009 IN.
DATE COMPLETED	DEC.22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN.	IN.	IN.	IN. IN.
1	1.0	.3524	.3533		
2	3.0	.3530	.3528	.0071	
3	7.0	.3568	.3546	.0099	.018
4	9.5	.3560	.3550	.0099	.016 .127 .112
5	12.5	.3551	.3541	.0098	.014 .125 .117
6	14.5	.3558	.3570	.0077	.012
7	18.0	.3563	.3551	.0094	.010 .123 .118
8	20.5	.3570	.3550	.0087	.011 .125 .119
9	22.0	.3552	.3550	.0090	.013
10	24.5	.3576	.3574	.0076	.016 .128 .114
11	28.5	.3588	.3564	.0069	.020 .128 .119
12	30.0	.3552	.3540	.0075	
13	33.5	.3520	.3504		

TABLE H-7. DIMENSIONAL AND PELLET DATA ON ELEMENT A 32

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	4
ROD WEIGHT	143.210 G.	PELLET WEIGHT AVG.	1.406 G.
ELEMENT WEIGHT	214.855 G.	PELLET WT. STD. D.	.001 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC.22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3500	.3528			
2	3.0	.3523	.3530	.0076		
3	7.0	.3565	.3580	.0084	.020	
4	9.5	.3561	.3563	.0093	.016	.124
5	12.5	.3568	.3560	.0097	.015	.126
6	14.5	.3572	.3562	.0094	.014	
7	18.0	.3570	.3565	.0087	.013	.130
8	20.5	.3550	.3563	.0087	.015	.126
9	22.0	.3570	.3570	.0087	.017	
10	24.5	.3560	.3595	.0077	.018	.130
11	28.5	.3590	.3594	.0066	.019	.128
12	30.0	.3538	.3543	.0068		.113
13	33.5	.3539	.3527			

TABLE H-8. DIMENSIONAL AND PELLET DATA ON ELEMENT A 34

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	2
ROD WEIGHT	142.387 G.	PELLET WEIGHT AVG.	1.400 G.
ELEMENT WEIGHT	213.890 G.	PELLET WT. STD. D.	.002 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.566 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.012 IN.
DATE COMPLETED	DEC.22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3531			
2	3.0	.3547	.3528	.0067		
3	7.0	.3570	.3558	.0085	.019	
4	9.5	.3567	.3570	.0087	.015	.124
5	12.5	.3558	.3560	.0083	.012	.127
6	14.5	.3578	.3558	.0075	.010	
7	18.0	.3565	.3560	.0078	.008	.125
8	20.5	.3565	.3540	.0089	.007	.126
9	22.0	.3570	.3553	.0083	.006	
10	24.5	.3587	.3583	.0067	.008	.130
11	28.5	.3582	.3584	.0063	.010	.129
12	30.0	.3553	.3557	.0068		.115
13	33.5	.3535	.3523			

TABLE H-9. DIMENSIONAL AND PELLET DATA ON ELEMENT A 35

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	1
ROD WEIGHT	142.350 G.	PELLET WEIGHT AVG.	1.408 G.
ELEMENT WEIGHT	213.055 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.011 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3545	.3520			
2	3.0	.3530	.3542	.0069		
3	7.0	.3550	.3580	.0080	.007	
4	9.5	.3565	.3562	.0078	.007	.123
5	12.5	.3540	.3538	.0102	.008	.126
6	14.5	.3555	.3555	.0083	.007	.115
7	18.0	.3566	.3558	.0076	.006	.128
8	20.5	.3565	.3557	.0078	.005	.126
9	22.0	.3532	.3538	.0096	.005	
10	24.5	.3584	.3584	.0059	.005	.125
11	28.5	.3573	.3578	.0071	.005	.124
12	30.0	.3525	.3545	.0070		.121
13	33.5	.3530	.3513			

TABLE H-10. DIMENSIONAL AND PELLET DATA ON ELEMENT A 40

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	6
ROD WEIGHT	142.710 G.	PELLET WEIGHT AVG.	1.417 G.
ELEMENT WEIGHT	213.410 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.009 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3520			
2	3.0	.3524	.3518	.0076		
3	7.0	.3572	.3554	.0096	.018	
4	9.5	.3554	.3572	.0103	.018	.125
5	12.5	.3568	.3561	.0091	.018	.124
6	14.5	.3570	.3568	.0090	.018	.115
7	18.0	.3558	.3558	.0103	.018	.125
8	20.5	.3553	.3570	.0095	.018	.116
9	22.0	.3554	.3560	.0100	.018	.124
10	24.5	.3584	.3574	.0069	.018	.119
11	28.5	.3591	.3571	.0075	.019	.127
12	30.0	.3540	.3530	.0075		.124
13	33.5	.3510	.3528			.117

TABLE H-11. DIMENSIONAL AND PELLET DATA ON ELEMENT A 41

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	7
ROD WEIGHT	142.510 G.	PELLET WEIGHT AVG.	1.409 G.
ELEMENT WEIGHT	213.365 G.	PELLET WT. STD. D.	.008 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.568 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.009 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3533	.3535			
2	3.0	.3530	.3533	.0075		
3	7.0	.3572	.3573	.0083	.011	
4	9.5	.3563	.3573	.0085	.008	.126
5	12.5	.3557	.3570	.0072	.007	.125
6	14.5	.3594	.3572	.0074	.006	.114
7	18.0	.3565	.3543	.0079	.006	.130
8	20.5	.3568	.3563	.0084	.008	.124
9	22.0	.3573	.3575	.0076	.007	
10	24.5	.3585	.3580	.0077	.007	.129
11	28.5	.3575	.3580	.0069	.006	.127
12	30.0	.3535	.3540	.0092		.112
13	33.5	.3520	.3527			

TABLE H-12. DIMENSIONAL AND PELLET DATA ON ELEMENT A 42

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	5
ROD WEIGHT	141.800 G.	PELLET WEIGHT AVG.	1.402 G.
ELEMENT WEIGHT	212.650 G.	PELLET WT. STD. D.	.003 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.570 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3530	.3510			
2	3.0	.3530	.3510	.0083		
3	7.0	.3567	.3550	.0093	.022	
4	9.5	.3558	.3552	.0095	.018	.124
5	12.5	.3540	.3540	.0097	.014	.125
6	14.5	.3538	.3543	.0101	.012	.118
7	18.0	.3552	.3552	.0087	.010	.122
8	20.5	.3550	.3545	.0092	.009	.124
9	22.0	.3538	.3548	.0085	.007	
10	24.5	.3585	.3565	.0071	.006	.126
11	28.5	.3572	.3572	.0070	.006	.128
12	30.0	.3530	.3530	.0079		.115
13	33.5	.3520	.3515			

TABLE H-13. DIMENSIONAL AND PELLET DATA ON ELEMENT A 43

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	3
ROD WEIGHT	142.740 G.	PELLET WEIGHT AVG.	1.400 G.
ELEMENT WEIGHT	213.045 G.	PELLET WT. STD. D.	.005 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.565 IN.
MAX SHEATH DIAM	.658 IN.	PELLET L. STD. D.	.009 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3520	.3545			
2	3.0	.3530	.3535	.0076		
3	7.0	.3532	.3556	.0092	.012	
4	9.5	.3570	.3568	.0081	.010	.120
5	12.5	.3550	.3558	.0085	.008	.121
6	14.5	.3545	.3560	.0091	.008	.118
7	18.0	.3560	.3570	.0088	.008	.129
8	20.5	.3558	.3558	.0094	.009	.113
9	22.0	.3551	.3562	.0084	.010	.126
10	24.5	.3563	.3582	.0079	.010	.121
11	28.5	.3560	.3574	.0076	.012	.123
12	30.0	.3532	.3540	.0078		.124
13	33.5	.3527	.3530			.120

TABLE H-14. DIMENSIONAL AND PELLET DATA ON ELEMENT A 46

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	12
ROD WEIGHT	143.062 G.	PELLET WEIGHT AVG.	1.408 G.
ELEMENT WEIGHT	213.975 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC. 22, 1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90 DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3542	.3518			
2	3.0	.3530	.3528	.0078		
3	7.0	.3575	.3562	.0091	.012	
4	9.5	.3563	.3558	.0097	.008	.126
5	12.5	.3573	.3568	.0085	.003	.115
6	14.5	.3562	.3553	.0096	.002	.127
7	18.0	.3555	.3563	.0092	.002	.114
8	20.5	.3555	.3563	.0089	.003	.126
9	22.0	.3563	.3568	.0092	.005	.118
10	24.5	.3567	.3567	.0087	.007	.124
11	28.5	.3600	.3575	.0065	.012	.116
12	30.0	.3585	.3590	.0049		.128
13	33.5	.3525	.3528			.117

TABLE H-15. DIMENSIONAL AND PELLET DATA ON ELEMENT A 47

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	15
ROD WEIGHT	142.500 G.	PELLET WEIGHT AVG.	1.406 G.
ELEMENT WEIGHT	213.350 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.569 IN.
MAX SHEATH DIAM	.660 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN.	IN.	IN.	IN.
1	1.0	.3533	.3533		
2	3.0	.3525	.3525	.0075	
3	7.0	.3570	.3560	.0092	.014
4	9.5	.3570	.3560	.0086	.014 .120 .115
5	12.5	.3558	.3558	.0092	.015 .120 .107
6	14.5	.3553	.3558	.0092	.015
7	18.0	.3565	.3560	.0092	.015 .120 .114
8	20.5	.3560	.3553	.0092	.015 .119 .116
9	22.0	.3570	.3554	.0089	.015
10	24.5	.3580	.3577	.0072	.016 .119 .117
11	28.5	.3585	.3570	.0070	.017 .120 .116
12	30.0	.3565	.3550	.0117	
13	33.5	.3535	.3535		

TABLE H-16. DIMENSIONAL AND PELLET DATA ON ELEMENT A 48

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	10
ROD WEIGHT	143.000 G.	PELLET WEIGHT AVG.	1.412 G.
ELEMENT WEIGHT	213.840 G.	PELLET WT. STD. D.	.009 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.572 IN.
MAX SHEATH DIAM	.661 IN.	PELLET L. STD. D.	.008 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER 0 DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX. MIN.
	END	IN.	IN.	IN.	IN.
1	1.0	.3539	.3512		
2	3.0	.3530	.3520	.0075	
3	7.0	.3563	.3550	.0102	.015
4	9.5	.3570	.3575	.0088	.013 .124 .117
5	12.5	.3573	.3575	.0089	.012 .128 .111
6	14.5	.3579	.3560	.0094	.010
7	18.0	.3590	.3563	.0089	.008 .122 .115
8	20.5	.3563	.3570	.0088	.008 .124 .118
9	22.0	.3573	.3570	.0089	.007
10	24.5	.3555	.3580	.0094	.008 .131 .113
11	28.5	.3580	.3590	.0075	.010 .128 .118
12	30.0	.3550	.3560	.0080	
13	33.5	.3510	.3529		

TABLE H-17. DIMENSIONAL AND PELLET DATA ON ELEMENT A 55

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	11
ROD WEIGHT	142.630 G.	PELLET WEIGHT AVG.	1.409 G.
ELEMENT WEIGHT	213.270 G.	PELLET WT. STD. D.	.004 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.571 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.010 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3525	.3525			
2	3.0	.3530	.3540	.0070		
3	7.0	.3565	.3563	.0091	.012	
4	9.5	.3663	.3562	.0042	.010	.118
5	12.5	.3653	.3563	.0048	.008	.116
6	14.5	.3658	.3563	.0048	.008	.114
7	18.0	.3662	.3552	.0043	.009	.116
8	20.5	.3653	.3553	.0047	.011	.115
9	22.0	.3658	.3559	.0036	.013	.109
10	24.5	.3568	.3568	.0091	.014	.119
11	28.5	.3575	.3580	.0072	.014	.116
12	30.0	.3530	.3535	.0073		.113
13	33.5	.3520	.3535			

TABLE H-18. DIMENSIONAL AND PELLET DATA ON ELEMENT A 56

TYPE LOADING	10G. 242PU	PELLET BATCH NO.	9
ROD WEIGHT	142.487 G.	PELLET WEIGHT AVG.	1.402 G.
ELEMENT WEIGHT	213.130 G.	PELLET WT. STD. D.	.007 G.
ELEMENT LENGTH	35.000 IN.	PELLET LENGTH AVG.	.575 IN.
MAX SHEATH DIAM	.659 IN.	PELLET L. STD. D.	.010 IN.
DATE COMPLETED	DEC.22,1964		

POSITION	IN. FROM NUMBERED	ROD DIAMETER n DEG. 90DEG.	COLLAPSE	SHEATH TIR	SHEATH SPACE MAX.	MIN.
	END	IN.	IN.	IN.	IN.	IN.
1	1.0	.3540	.3537			
2	3.0	.3540	.3527	.0071		
3	7.0	.3560	.3560	.0103	.020	
4	9.5	.3570	.3554	.0094	.019	.122
5	12.5	.3560	.3560	.0090	.018	.123
6	14.5	.3568	.3570	.0093	.016	.114
7	18.0	.3561	.3552	.0093	.014	.122
8	20.5	.3560	.3550	.0107	.015	.111
9	22.0	.3563	.3557	.0091	.016	.124
10	24.5	.3564	.3559	.0088	.018	.113
11	28.5	.3589	.3580	.0067	.020	.122
12	30.0	.3550	.3548	.0067		.116
13	33.5	.3530	.3510

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