CHAPTER 3

EXPERIMENTAL PROCEDURES

3.1. General Facilities

Most experiments were done at the Naval Surface Weapons Center (NSWC). The facility used is a test chamber with 61-cm-thick, steel-reinforced concrete walls to contain the explosion and accompanying noise. It was equipped with a streak camera and a number of oscilloscopes. The Cordin 132 streak camera is capable of writing on the film at speeds up to 20 mm/μsec. Ancillary equipment for calibration and for synchronizing the recording equipment was also available. An explosive preparation facility was available to cast, machine, and press explosive charges to specifications. A computer facility consisting of a CDC 6400 computer and accessory equipment was available for use in data reduction.

The preparation of target components and their assembly was all done by the author. Preparation included the machining and lapping of most components. Assembly, preparation, and handling of explosive components were done by a technician, as required by operating procedures of the laboratory. This technician also assisted the author in optically aligning test assemblies for streak camera experiments. All other aspects of the

experiments were done by the author, except where otherwise indicated in the text.

Two quartz gage experiments were done at the Shock Dynamics Laboratory at Washington State University, whose facilities are described elsewhere.[40]

3.2. Armco Iron Properties

A 10.2-cm-diameter, 61.0-cm-long bar of Armco Magnetic Ingot iron was obtained for this program. This large specimen was obtained to insure that similar test samples would be used throughout the course of the study. All samples for this program came from a 10-cm length of this bar and were used as received except for cutting, surface grinding, and lapping of sample faces. Metallurgical properties of iron and procedures for sample preparations are given below.

3.2.1. Metallurgical Properties

Impurities present in a single unshocked sample of Armco iron were obtained by the NSWC using wet chemical and spectrochemical analyses. The sample tested was 99.84 percent pure iron, and accuracy of the over-all analysis was better than 0.05 percent. Unmeasurable traces of silicon, nickel, chromium, and molybdenum were detected. Measurable amounts of carbon (0.14 percent), phosphorous (0.002 percent), sulfur (0.014 percent), manganese (0.025 percent), and copper (0.11 percent) were found. It was assumed that all samples maintained these purity limits even though no other measurements were made.