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# AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS

## ON THE CONDUCT OF A JOINT VERIFICATION EXPERIMENT

MAY 1988

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# THE UNITED STATES OF AMERICA
# AND THE UNION OF SOVIET SOCIALIST REPUBLICS
# ON THE CONDUCT OF A JOINT VERIFICATION EXPERIMENT

The United States of America and the Union of Soviet Socialist Republics, hereinafter referred to as the Parties,

Reaffirming the statement of the Secretary of State of the United States and the Foreign Minister of the Union of Soviet Socialist Republics of December 9, 1987,

Proceeding from the agreement to conduct a Joint Verification Experiment, hereinafter referred to as JVE, for the purpose of the elaboration of effective verification measures for the Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Underground Nuclear Weapon Tests, hereinafter referred to as the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests,

Taking into account the agreements reached by the U.S. and Soviet delegations at the negotiations in Geneva on specific JVE technical procedures and organizational plans in full conformity with the December 9, 1987, ministerial statement,

Have agreed as follows:

1. For purposes of the JVE, there shall be two nuclear explosions, one at the U.S. Nevada Test Site and one at the USSR Semipalatinsk Test Site, each hereinafter being referred to as a JVE explosion.

2. The planned yield of the JVE explosion at each test site shall be not less than 100 kilotons and shall approach 150 kilotons.

3. Each Party shall have the opportunity to measure, on the basis of reciprocity, the yield of the JVE explosion conducted at the other Party's test site using teleseismic methods and, at the other's test site, using hydrodynamic yield measurement methods.

4. Each Party shall also perform teleseismic measurements with its national seismic station network for both JVE explosions. To assist in teleseismic measurement, the Parties shall exchange data on five nuclear explosions conducted after January 1, 1978 but before January 1, 1988 to include yield, date and time, geographic coordinates, depth of burial, and associated geological and geophysical data. For each of these historical explosions, the Parties shall exchange teleseismic recordings taken at five designated stations on each side including station corrections and the best network seismic magnitude.

5. Each Party shall perform hydrodynamic yield measurements within the satellite hole provided for that purpose of the JVE explosions at both Parties' test sites using the methods it has identified in this Agreement.

6. As a yield standard, the experiment will include yield measurement within the emplacement hole of the JVE explosions at both Parties' test sites using the hydrodynamic methods each Party has identified in this Agreement. Each Party shall report to the other Party the yield values of each of the JVE explosions that are derived by each Party on the basis of hydrodynamic yield measurements undertaken within the satellite hole and within the emplacement hole. Each Party shall undertake for the purpose of the JVE to ensure at its test site a test configuration that will allow each Party to obtain an accurate yield standard of the JVE explosion. The use of hydrodynamic yield measurement methods within the emplacement hole by the visiting Party is being undertaken only in the JVE, and such measurement methods within the emplacement hole shall not be proposed by either Party for verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

7. In the course of the JVE, each Party shall carry out teleseismic measurements of both JVE explosions at its five seismic stations for which historical data were exchanged. The Parties shall exchange the seismic data obtained in the JVE in corresponding detail to that exchanged for the historical explosions.

8. The JVE will provide information on the basis of which each Party can demonstrate the effectiveness of its hydrodynamic yield measurement methods at the test site of the other Party. Because the JVE is not designed to produce statistically significant results, it cannot by itself establish statistical proof of the accuracy of any particular yield measurement method.

9. The JVE conducted at both test sites will provide sufficient information to resolve all concerns, except those of a statistical nature, that have been identified by either Party regarding methods proposed by the other Party for verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests by providing an example of the effectiveness of the verification methods used in the JVE and by demonstrating their practicability and non-intrusiveness.

10. Specific design procedures of the JVE configuration within the emplacement hole that may have been necessary to accommodate technical objectives of the JVE shall not provide a basis for objections by either Party regarding the use of hydrodynamic yield measurements within the satellite hole for future nuclear tests. Such design procedures of the JVE configuration shall not establish a precedent for requiring similar design procedures in the two Parties' future tests as a condition for agreement on measures permitting effective verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

11. The JVE will assist the Parties in: finalizing operational procedures for the conduct of hydrodynamic yield measurements within the satellite hole and teleseismic yield measurements for verification of future nuclear tests; establishing procedures for gathering the geological and geophysical data that is to be exchanged in accordance with any

future yield measurement method proposed by either Party; determining procedures for exchange of data by the Parties on shock-wave properties of rock; comparing procedures to be used by the Parties for analyzing results of either hydrodynamic or teleseismic yield measurement methods proposed by either Party; and considering improved measures for reducing any intrusiveness associated with the verification methods proposed by each Party.

12. The Parties will use their best efforts to conduct the JVE explosions in accordance with the schedule specified in the Annex.

13. The exchange of the data obtained in the preparation for and conduct of the JVE and of the results of the analysis by each Party will be done in accordance with the schedule specified in the Annex with a view toward agreement on measures providing for effective verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

14. Upon request by either Party, the Parties shall meet promptly to discuss any question or concern that may arise concerning the provisions of this Agreement.

15. Each Party shall treat with due respect the personnel of the other Party in its territory in connection with the preparatory work for, and execution of, the JVE and shall take all appropriate steps to prevent any attack on the person, freedom and dignity of such personnel.

16. To ensure the effective implementation of the foregoing provisions, the Parties have reached the agreements set forth in the Annex, which form an integral part of this Agreement.

This Agreement, including the Annex hereto, shall enter into force upon signature.

DONE at Moscow on May 31, 1988, in two copies, each in the English and Russian languages, both texts being equally authentic.

FOR THE UNITED STATES OF AMERICA

George P. Shultz

FOR THE UNION OF SOVIET SOCIALIST REPUBLICS

Eduard Shevardnadze

ANNEX
TO THE AGREEMENT BETWEEN THE UNITED STATES OF AMERICA AND THE UNION OF SOVIET SOCIALIST REPUBLICS ON THE CONDUCT OF A JOINT VERIFICATION EXPERIMENT

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I

## 1. THE USE OF THE TELESEISMIC METHOD IN THE JVE

### I. Introduction

1. During the conduct of the JVE, on the basis of complete reciprocity, the sides will be able to do the following:

a. to record, using existing seismic stations, seismic signals for both JVE explosions, for which exact coordinates, standard yields measured by hydrodynamic methods in the emplacement hole, depth, date, and time shall be known;

b. to exchange the results of recording seismic signals from both JVE explosions from ten designated teleseismic stations (five stations from each side) as defined below, as well as characteristics of those stations and of their seismic equipment;

c. to exchange geological and geophysical information about the regions where both JVE explosions will be conducted at the test sites of the sides.

2. In addition, during the conduct of the JVE the sides will exchange, on a reciprocal basis, information about five historic explosions of each side, to include the following:

a. yield, date, time, coordinates, and the depth of the explosions;

b. geological and geophysical information about the region where each of the explosions was conducted;

c. archival seismic recordings for each of the ten explosions, recorded by the designated teleseismic stations of the sides.

The data exchange shall include the geological and geophysical information and data on parameters of historic explosions, thereby satisfying the Protocol to the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

Noting the exchange of data on five historic nuclear explosions conducted by each side, both sides emphasize the special importance of the JVE explosions in providing the first opportunity for obtaining explosion yield values validated through the direct on-site yield measurements carried out by both sides.

3. As a result of the JVE the sides will discuss teleseismic methods as provided for in the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment. In examining the JVE results no national technical means of either side will be discussed. The U.S. side states that it

will not propose any teleseismic methods for discussion. Discussion of teleseismic methods which are proposed by the Soviet Union for future verification will not mean in itself an official endorsement by the United States of any particular methods being discussed.

## II. Definitions

Teleseismic method of estimating the yield of an explosion means a method based on the relationship between an explosion's yield and the parameters of elastic ground motions caused by an explosion and recorded at teleseismic (approximately 25 degrees to 90 degrees) distances from the explosion.

Designated teleseismic stations -- five seismic stations, chosen from those stations which, at the time of the JVE, provide earthquake and other natural seismic event data publicly, designated for JVE purposes by each side on its territory and located at teleseismic distances from both JVE explosions, and with regard to which the sides shall exchange archival seismic recordings of historic explosions, characteristics of the stations and of their seismic equipment, as well as seismic recording material of both JVE explosions.

Historic explosion -- a nuclear explosion conducted at the Nevada or Semipalatinsk Test Site between January 1, 1978 and January 1, 1988, which has been identified by the sides for exchange of information in accordance with Paragraph 4 of the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment.

Explosion region -- a volume of earth in which an explosion is conducted, delineated by a vertical cylinder the axis of which goes through the point of emplacement of the device, that has a radius equal to the depth of the device emplacement, and with a depth from the surface equal to twice the depth of the emplacement.

## III. Schedule of Operations

| Date | Activity |
|---|---|
| May 12 | Exchange of lists of the historic explosions, indicating the date and time. |
| May 23 | Exchange of the reference matrices containing information about the availability of seismic recordings of historic explosions at the designated teleseismic stations. |

| | |
|---|---|
| May 24 | Final selection by each party of its designated teleseismic stations, and exchange of lists of such stations. |
| June 28 | Exchange of complete data on historic explosions, including seismic recordings of them from the designated teleseismic stations. |
| | Exchange of complete data on the characteristics of the designated teleseismic stations and on their seismic equipment. |
| Prior to each JVE explosion | Preparation by the sides of teleseismic stations and organization of measurement of seismic signals from the JVE explosions at those stations. |
| 10 days after each JVE explosion | Exchange of seismic measurement data of the JVE explosion, obtained by the sides at the designated teleseismic stations. |
| September | Discussion by the sides of the results of the JVE obtained by the teleseismic measurements. |

IV. Brief Description of the Operation to be Carried Out

1. Exchange of data on historic explosions:

a. the historic explosions (five at the NTS and five at the STS) shall be selected with yields within the 100-150 kt range, and they must as fully as possible correspond to the availability of archival seismic recordings of those explosions at the designated teleseismic stations;

b. the following shall be subject to exchange: date, time, geodetic coordinates of the emplacement hole, depth of the explosion, yield, geological and geophysical data on the explosion region, seismic recordings of the given explosion from the designated teleseismic stations;

c. the sequence, exchange procedures, and the detailed composition of the data to be exchanged shall be governed by document No. 2, "Designated Teleseismic Stations," and document No. 3, "Procedure for Exchanging, During the JVE, Data Related to the Seismic Method, Including All Those Data Exchanges Provided for in the Protocol to the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests, on Five Historic Nuclear Explosions at Each Party's Test Site."

2. Exchange of data related to the designated teleseismic stations:

a. designated teleseismic stations (five stations from each side) shall be used for recording seismic signals from both JVE explosions and for providing by the sides, on a reciprocal basis, the recordings of those signals and archival seismic recordings on ten historic explosions;

b. the following shall be subject to exchange: characteristics of the designated teleseismic stations and of their seismic equipment, seismic recordings of the JVE explosions, and archival seismic recordings of the historic explosions;

c. average network magnitude values and their uncertainty, calculated by each side from the station magnitude data for the seismic stations used by the side;

d. procedures for selecting the designated teleseismic stations, sequence, exchange procedures, and detailed composition of the data to be exchanged shall be governed by document No. 2, and document No. 5, "Procedure for Exchanging Data Obtained from the Teleseismic Measurements of the JVE Explosions."

3. Exchange of geological and geophysical information about the JVE explosion regions:

a. the following shall be subject to exchange: stratigraphic and lithologic columns indicating thickness and depth of layers as well as geological description of rocks, basic physical properties of rocks, and information on the water table and geophysical heterogeneities;

b. the results of the analysis of cores obtained during the drilling in the JVE explosion region from structural, emplacement, and satellite holes shall serve as sources for obtaining information, as well as the results of laboratory and logging operations conducted for the purposes of teleseismic and hydrodynamic measurements. With respect to earth layers located below the depth of emplacement, provision of data based on geological and geophysical forecast shall be allowed;

c. the detailed composition and format for reporting geological and geophysical information to be exchanged, as well as time frame and procedure for the exchange, shall be governed by document No. 4, "Procedure for Exchanging Geological and Geophysical Information on the JVE Explosion Areas, Including Logging of the Emplacement Hole, in the Interest of the Seismic Method."

4. The preparation by the sides of their teleseismic stations, as well as organization of measurements of signals from both JVE explosions at those stations, shall be carried out in accordance with the normal practice of the sides.

5. In accordance with document No. 6, "Procedure for Data Exchange and Discussion of the Results of the JVE Explosion Yield Determination Derived Through Seismic Measurements," the sides will discuss the teleseismic measurement data and results of the JVE explosions obtained from the designated teleseismic stations and other teleseismic stations, to be chosen by each side at its discretion as a network for determining an average network magnitude for the JVE explosions.

6. The exchange of all data will be carried out by the sides in accordance with the schedule. The exchange of data shall be carried out simultaneously. The data will include the necessary textual explanations containing exhaustive information with regard to the adequacy of the composition and volume of those data to the requirements concerning those data in documents No. 2, through No. 6,. The provided data shall be signed by the Head of Delegation. After the exchange each side shall be able to receive clarifications on questions related to the data provided. Based on the results of each exchange, the sides shall prepare a document summarizing the nature of the information provided in the course of the exchange. This document shall be signed by the Heads of Delegation.

The exchange shall take place in Geneva, Switzerland.

7. The use or non-use or discussion of specific procedures of teleseismic methods as a part of the JVE shall not establish a precedent for requiring or rejecting such procedures as a condition for agreement on measures permitting effective verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

## 2. DESIGNATED TELESEISMIC STATIONS

### I. Introduction

For the purposes of the JVE, each side shall designate five teleseismic stations located on its territory at teleseismic distances from both JVE explosions.

The designated teleseismic stations shall record seismic signals from the JVE explosions.

The following shall be provided from each station for a reciprocal exchange:

- seismic recording material of both JVE explosions;
- archival seismic recording material to the extent possible with respect to each of the ten historic explosions (five explosions from each side);
- characteristics of these stations and of their seismic equipment.

This document shall determine the procedures for selecting designated teleseismic stations and seismic recording material from the archives of each side on historic explosions, which shall be subject to exchange, and it shall specify the sequence of the sides' activities during the preparation of data for and within the exchange, as well as the schedule to be followed during the JVE. Procedures for exchanging data from designated teleseismic stations, obtained during the JVE explosions, are set forth in document No. 5, "Procedure for exchanging data obtained from the teleseismic measurements of the JVE explosions."

## II. Definitions

Designated teleseismic stations -- five seismic stations chosen from those stations which, at the time of the JVE, provide earthquake and other natural seismic event data publicly, being designated for JVE purposes by each side on its territory and located at teleseismic distances from both JVE explosions, and with regard to which the sides shall exchange archival seismic recording material on historic explosions, characteristics of the stations and of their seismic equipment, as well as seismic recording material of both JVE explosions.

Teleseismic distance -- shall be understood to mean a distance measured along the surface of the earth from the epicenter of a JVE explosion to a designated teleseismic station and approximately greater than 25 degrees and less than 90 degrees from the epicenter.

Historic explosion -- a nuclear explosion conducted at the Semipalatinsk Test Site or Nevada Test Site between January 1, 1978, and January 1, 1988, which has been identified by the sides for exchange of information in accordance with Paragraph 4 of the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment.

## III. The Procedure of Selecting Designated Teleseismic Stations

Selection of the designated teleseismic stations shall be carried out in the following sequence:

1. Exchange of information on dates and times with regard to five historic explosions chosen by each side for selecting stations that have representative archives of seismic recordings of these explosions, and which may be included in the list of designated teleseismic stations. The historic explosions shall be selected in accordance with the procedures contained in document No. 3, "Procedure for exchanging, during the JVE, data related to the seismic method, including all those data exchanges provided for in the Protocol to the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests, on five historic nuclear explosions at each side's test site."

2. Provision of lists of designated teleseismic stations, prepared by each side. Each side will select its stations that recorded the seismic signals of historic explosions. It shall be assumed that these seismic stations basically have been continuously functioning since January 1, 1978, and that they will be functioning during the conduct of the JVE explosions. The sides shall present their results of selecting these stations in the form of a reference matrix showing the availability of suitable seismic recordings of the historic explosions at the selected teleseismic stations. A sample reference matrix is attached as Attachment 2.1.

3. Discussion by the sides of reference matrices containing the results of selecting designated teleseismic stations. Based on the results of the discussion, the sides shall decide the question of exchanging seismic recordings, as well as the question of the need to include additional (in excess of five) teleseismic stations, so as to meet the requirement concerning provision to each side of five seismic recordings on each historic explosion.

## IV. Information to be Exchanged on the Designated Teleseismic Stations

1. Characteristics of the stations:

a. the name of the station and designated reference code for the JVE;

b. station coordinates with an accuracy of one angle minute for the geodetic latitude and longitude;

c. the station elevation above mean sea level with an accuracy of 10 meters;

d. characteristics of the rock on which the station is located, and a general geophysical description of the medium beneath the station;

e. conditions in which the seismic instruments are installed (in a mine, in an adit, in a basement, in a borehole), including the depth of installation;

f. the station magnitude correction and its root mean square error with an accuracy of 0.01 magnitude units, with regard to the Nevada Test Site and Semipalatinsk Test Site, to be calculated on the basis of the data from the five designated teleseismic stations and other teleseismic stations to be chosen by each side at its own discretion as a network for determining the average network magnitude.

2. Characteristics of seismic equipment:

a. description of seismic equipment;

b. the amplitude-versus-frequency and phase-versus-frequency characteristics of the short-period seismic channels.

3. Information on the recording media used (paper, film, magnetic tape, etc.). If seismic recording material is to be in digital form, the designating side shall provide a description of the recording format and a sample computer program to read the digital data.

## V. Data to be Exchanged on Seismic Recordings and Average Network Magnitudes of Historic Explosions

1. Recordings of short period seismic signals from the historic explosions, including a segment of the recording with the duration of up to 30 minutes after the P-wave arrival, but not shorter than 3 minutes in duration, as well as a 1 minute recording segment preceding the arrival of the P-wave.

2. Results of calibration of seismic channels in accordance with the practice adopted at the stations of the sides, which apply to the time at which signals from the historic explosions were recorded at the stations; data on channel calibration shall be provided to enable the conversion of the recorded signal to absolute ground displacement in nanometers.

For the purposes of documentation, graphical representation of the recorded signals on a paper medium shall be provided in addition to a copy of the recording on the medium originally used.

3. Average network magnitude for longitudinal waves and its mean square root error with an accuracy of 0.01 magnitude units, to be calculated on the basis of the data from the five designated teleseismic stations and other teleseismic stations to be chosen by each side at its own discretion as a network for determining the average network magnitude.

4. The calibration function used in calculations.

## VI. Timing and Procedure for the Exchange of Data

| Date | Activity |
|---|---|
| May 12 | Exchange of information on the historic explosions pursuant to para. 1 of Section III of this document. |
| May 23 | Exchange of the reference matrices pursuant to para. 2 of Section III of this document. |
| May 24 | Selection of the designated teleseismic stations pursuant to para. 2 of Section III of this document. |
| June 28 | The exchange of complete data on the designated teleseismic stations pursuant to Sections IV and V of this document. |

The exchange of data shall be carried out simultaneously. The data shall include the necessary textual explanations containing exhaustive information with regard to the adequacy of the composition and volume of those data to the requirements in this document concerning those data. The submitted data exchanged shall be signed by the Head of Delegation.

## VII. Documentation of the Exchange

After the exchange each side shall be able to receive clarifications on questions related to the data provided.

Based on the results of the exchange the sides shall prepare a document summarizing the nature of the information provided in the course of the exchange. This document shall be signed by the Heads of Delegation.

The exchange shall take place in Geneva, Switzerland.

ATTACHMENT 2.1

Sample Reference Matrix Indicating Availability
At the Designated Teleseismic Stations
of Data on Historic Explosions

Candidate Teleseismic Stations
*Designated Teleseismic Stations

| | | | A | B | C | D | E | (F) | (G) |
|---|---|---|---|---|---|---|---|---|---|
| | | HE1 | + | | | | | | |
| + | + | 0 | + | | | | | | |
| + | 0 | | | | | | | | |
| | | HE2 | + | | | | | | |
| + | + | + | - | | | | | | |
| + | 0 | | | | | | | | |
| | | HE3 | + | | | | | | |
| + | 0 | + | + | | | | | | |
| 0 | + | | | | | | | | |
| | | HE4 | 0 | | | | | | |
| + | + | + | + | | | | | | |
| + | - | | | | | | | | |
| | | HE5 | + | | | | | | |
| 0 | + | + | + | | | | | | |
| + | + | | | | | | | | |
| | | HE6 | + | | | | | | |
| + | + | + | + | | | | | | |
| - | - | | | | | | | | |
| | | HE7 | + | | | | | | |
| 0 | + | + | + | | | | | | |
| + | 0 | | | | | | | | |
| | | HE8 | + | | | | | | |
| + | + | + | + | | | | | | |
| 0 | + | | | | | | | | |
| | | HE9 | + | | | | | | |
| + | + | + | - | | | | | | |
| 0 | + | | | | | | | | |
| | | HE10 | + | | | | | | |
| + | - | + | + | | | | | | |
| + | + | | | | | | | | |

Total + available for exchange: 53
Total - available for exchange: 6

Legend:

| | |
|---|---|
| + | complete seismic recording available |
| 0 | seismic recording not available |
| - | partial seismic recording available, including the main P-wave |
| HE | historic explosion |
| A,B,C,D,E | designated teleseismic stations |
| (F) (G) | additional alternate stations |

## 3. PROCEDURE FOR EXCHANGING, DURING THE JVE, DATA RELATED TO THE SEISMIC METHOD, INCLUDING ALL THOSE DATA EXCHANGES PROVIDED FOR IN THE PROTOCOL TO THE 1974 TREATY ON THE LIMITATION OF UNDERGROUND NUCLEAR WEAPON TESTS, ON FIVE HISTORIC NUCLEAR EXPLOSIONS AT EACH SIDE'S TEST SITE

### I. Introduction

The exchange of data during the JVE on five historic nuclear explosions shall be carried out by the sides on the basis of reciprocity.

The data exchange shall include the geological and geophysical information and data on parameters of historic explosions, thereby satisfying the 1974 Protocol to the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

### II. Definitions

Historic Explosion -- a nuclear explosion conducted at the Nevada Test Site or Semipalatinsk Test Site between January 1, 1978, and January 1, 1988, which has been identified by the sides for exchange of information in accordance with Paragraph 4 of the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment.

Historic Explosion Region -- a volume of the earth in which an explosion was conducted, delineated by a vertical cylinder the axis of which goes through the point of emplacement of the device, that has a radius equal to the depth of the device emplacement, and with a depth from the surface equal to twice the depth of the emplacement.

### III. Conditions for the Selection of Explosions

1. Historic explosions must have the actual yield in the range of 100-150 kilotons and, whenever possible, should be selected in such a way so as to approach the upper limit of this range.

2. The total number of historic explosions at the Nevada and Semipalatinsk Test Sites shall consist of five explosions at each test site, and data on them shall be subject to exchange.

The Soviet side shall provide to the U.S. side data on five historic explosions which were conducted at the Semipalatinsk Test Site. To the extent possible the data of these explosions should represent the geologic diversity of the given test site.

The U.S. side shall provide the Soviet side data on five historic explosions which were conducted at the Nevada Test Site. To the extent possible the data of these explosions should represent the geologic diversity of the given test site.

3. The selection of historic explosions shall be carried out in such a way so as to correspond to the maximum extent to the requirements of document No. 2, "Designated seismic stations," in terms of the availability and quality of seismic recordings of signals of these explosions at the designated teleseismic stations.

IV. Data on the Parameters of Historic Explosions

1. The sides shall exchange the following data on each historic explosion selected by the side:

-- Explosion date (Greenwich);
-- Explosion time (Greenwich) with an accuracy of 0.1 second;
-- Depth of device emplacement with an accuracy of 1 meter;
-- Geographic coordinates of the emplacement hole with an accuracy of 1 angular minute;
-- Explosion yield to the nearest kiloton.

2. For the purposes of the exchange, the sides shall use yield values of historic explosions, obtained on the basis of measurements carried out by the most precise methods.

V. Geological and Geophysical Information on Historic Explosion Regions Subject to Exchange

1. Stratigraphic column (see Attachment 3.1).
2. Lithologic column indicating the thickness and depth of rock strata (see Attachment 3.1).
3. Geological description of the historic explosion region including characteristics of geological formations.
4. Basic physical properties of rock:
   a. bulk density;
   b. porosity;
   c. moisture saturation;
   d. longitudinal seismic wave propagation velocity.
5. Water table level.
6. Detailed geological description of the emplacement hole on the basis of direct geological measurements.
7. Information on any known geophysical heterogeneities of the medium in the historic explosion region.

VI. Sources of Geological and Geophysical Information

The sources of the geological and geophysical information shall be the results of the analysis of cores selected during the drilling in the historic explosion region, from the emplacement and structural holes, as well as the results of laboratory and geophysical logging operations.

Where possible, accuracy characteristics shall be given for physical values subject to the exchange.

If no direct geological and geophysical measurements of the zone below the depth of device emplacement are available, geological and geophysical information on this zone may be provided in the form of a geological and geophysical forecast. If the forecasting method is used, the testing side shall inform the other side and shall provide information on how the forecast was made.

## VII. Format of Data Provision

1. Data on the parameters of historic explosions shall be provided in the form convenient for each side. Reference codes shall be given to the historic explosions: for explosions of the U.S. side, HE1...HE5; for explosions of the Soviet side, HE6...HE10; explosions of both sides shall be numbered in a chronological order.

2. Geological and geophysical information subject to exchange shall be provided in the form of a table, as described in the Attachment 3.1. The required additional information not included in the table shall be provided in a textual form and shall be attached to the table.

## VIII. Timing and Procedure for the Exchange of Data

| Date | Activity |
|---|---|
| May 12 | Exchange of data on the dates and times of historic explosions for the selection of the teleseismic stations to be designated and for the preparation for the exchange of the teleseismic recordings of historic explosions, as provided for in document No. 2, "Designated teleseismic stations." |
| June 28 | Exchange of data on other parameters of historic explosions pursuant to Para. 1 of Section IV of this document. |

The exchange of data shall be carried out simultaneously. The data shall include the necessary textual explanations containing exhaustive information with regard to the adequacy of the composition and volume of those data to the requirements in this document concerning those data. The submitted data subject to exchange shall be signed by the Head of Delegation.

## IX. Documentation of the Exchange

After the exchange, each side shall be able to receive clarifications on questions related to the data provided.

Based on the results of the exchange the sides shall prepare a document summarizing the nature of the information provided in the course of the exchange. This document shall be signed by the Heads of Delegation.

The exchange shall take place in Geneva, Switzerland.

ATTACHMENT 3.1

GEOLOGICAL AND GEOPHYSICAL INFORMATION
ON THE EXPLOSION REGION AT THE
SEMIPALATINSK TEST SITE (EXAMPLE)

| DEPTH (m) | STRATI-GRAPHIC INDEX | NUMBER OF STRATUM | DEPTH OF STRATUM BOTTOM (m) | THICKNESS OF STRATUM (m) | LITHO-LOGICAL COLUMN | GEOLOGICAL DESCRIPTION OF ROCK | HYDRO GEOLOGICAL CONDITIONS | LONGITUDINAL SEISMIC WAVE VELOCITY (M/SEC) | BULK DENSITY (g/cm³) | POROSITY | WATER SATURATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -10 | Q III - IV | 1 | 12.0 | 12.0 | | sand-gravel polymictous; at the base of the stratum boulders | -10 m | 1200 | 2.1 | 5.2 | 2.2 |
| -30 | 1 - 2 N 1 ar | 2 | 18.0 | 6.0 | | red-brown clay, low plasticity, cracks | | 3400 | 2.2 | 1.0 | 0.5 |
| | | 3 | 31.0 | 13.0 | | greyish-green clay with layers of plate gypsum | | | | | |
| -70 | | 4 | 75.0 | 44.0 | | grey granite with pink-green tint; small grains. Rock is cataclized, mylonized in the form of 3-5 cm zones at 20-30° angle from core axis. Exogenic cracks - up to 72 m. | | 4500 | 2.6 | 0.2 | 0.5 |
| | | 5 | 105.5 | 20.0 | | Zone of tectonic fracturing, chlorization, and mylonization. Up to 105 m, cracks with slipping mirrors at 15-20° angle from core axis. Fragments of lighter rock in the main chloritized mylonite. In the 75-83 m range - segments of secondary light-grey quartzite | | 5030 | 2.7 | 0.2 | 0.5 |

## 4. PROCEDURE FOR EXCHANGING GEOLOGICAL AND GEOPHYSICAL INFORMATION ON THE JVE EXPLOSION AREAS, INCLUDING LOGGING OF THE EMPLACEMENT HOLE, IN THE INTEREST OF THE SEISMIC METHOD

### I. Introduction

The sides shall, on the basis of reciprocity, exchange geological and geophysical information on the JVE explosion regions.

### II. Definition

JVE Explosion Region -- a volume of the earth in which the JVE explosion shall be conducted, delineated by a vertical cylinder the axis of which goes through the point of emplacement of the device, that has a radius equal to the depth of the device emplacement, and with a depth from the surface equal to twice the depth of the emplacement.

### III. Geological and Geophysical Information Subject to Exchange

1. Stratigraphic column (see Attachment 4.1).
2. Lithologic column indicating the thickness and depth of rock strata (see Attachment 4.1).
3. Geological description of the JVE explosion region including characteristics of geological formations.
4. Basic physical properties of rock:
    a. bulk density;
    b. porosity;
    c. water saturation;
    d. longitudinal seismic wave propagation velocity.

5. Water table level.
6. Detailed geological description of the emplacement hole on the basis of direct geological measurements.
7. Information on any known geophysical heterogeneities of the medium in the explosion region.

### IV. Sources of Geological and Geophysical Information

The sources of the geological and geophysical information shall be the results of the analysis of cores, selected during the drilling in the JVE explosion region from the structural, emplacement, and satellite holes, as well as the results of the laboratory and geophysical logging operations carried out in the interest of both the seismic and hydrodynamic measurements.

Where possible, accuracy characteristics shall be given for physical values subject to the exchange.

If no direct geophysical and geological measurements of the zone below the depth of device emplacement are available, geological and geophysical information on this zone may be provided in the form of a geological and geophysical forecast. If the forecasting method is used, the testing side shall inform the other side and shall provide information on how the forecast was made.

## V. Format of Data Provision

Geological and geophysical information subject to exchange shall be provided in the form of a table, as described in Attachment 4.1. The required additional information not included in the table shall be provided in a textual form and shall be attached to the table.

## VI. Timing and Procedure for the Exchange of Data

| Date | Activity |
|---|---|
| June 28 | Exchange of geological and geophysical information pursuant to Section III of this document. |

The exchange of data shall be carried out simultaneously. The data shall include the necessary textual explanations containing exhaustive information with regard to the adequacy of the composition and volume of those data to the requirements in this document concerning those data. The submitted data subject to exchange shall be signed by the Head of Delegation.

## VII. Documentation of the Exchange

After the exchange, each side shall be able to receive clarifications on questions related to the data provided.

Based on the results of the exchange the sides shall prepare a document summarizing the nature of the information provided in the course of the exchange. This document shall be signed by the Heads of Delegation.

The exchange shall take place in Geneva, Switzerland.

ATTACHMENT 4.1

GEOLOGICAL AND GEOPHYSICAL INFORMATION
ON THE EXPLOSION REGION AT THE
SEMIPALATINSK TEST SITE (EXAMPLE)

| DEPTH (m) | STRATI-GRAPHIC INDEX | NUMBER OF STRATUM | DEPTH OF STRATUM BOTTOM (m) | THICKNESS OF STRATUM (m) | LITHO-LOGICAL COLUMN | GEOLOGICAL DESCRIPTION OF ROCK | HYDRO GEOLOGICAL CONDITIONS | LONGITUDINAL SEISMIC WAVE VELOCITY (M/SEC) | BULK DENSITY (g/cm³) | POROSITY | WATER SATURATION |
|---|---|---|---|---|---|---|---|---|---|---|---|
| -10 | Q III - IV | 1 | 12.0 | 12.0 | | sand-gravel polymictous; at the base of the stratum boulders | -10 m | 1200 | 2.1 | 5.2 | 2.2 |
| -30 | 1 - 2 N 1 ar | 2 | 18.0 | 6.0 | | red-brown clay, low plasticity, cracks | | 3400 | 2.2 | 1.0 | 0.5 |
| | | 3 | 31.0 | 13.0 | | greyish-green clay with layers of plate gypsum | | | | | |
| -70 | | 4 | 75.0 | 44.0 | | grey granite with pink-green tint; small grains. Rock is cataclized, mylonized in the form of 3-5 cm zones at 20-30° angle from core axis. Exogenic cracks - up to 72 m. | | 4500 | 2.6 | 0.2 | 0.5 |
| | | 5 | 105.5 | 20.0 | | Zone of tectonic fracturing, chlorization, and mylonization. Up to 105 m, cracks with slipping mirrors at 15-20° angle from core axis. Fragments of lighter rock in the main chloritized mylonite. In the 75-83 m range - segments of secondary light-grey quartzite | | 5030 | 2.7 | 0.2 | 0.5 |

## 5. PROCEDURE FOR EXCHANGING DATA OBTAINED FROM THE TELESEISMIC MEASUREMENTS OF THE JVE EXPLOSIONS

### I. Introduction

The designated teleseismic stations shall record seismic signals of both JVE explosions. This document defines the dates and procedures for exchanging copies of recordings of the seismic signals of the JVE explosions, recorded by the designated teleseismic stations.

### II. Definition

Designated Teleseismic Stations -- five seismic stations, chosen from those stations which, at the time of the JVE, provide earthquake and other natural seismic event data publicly, being designated for JVE purposes by each side on its territory and located at teleseismic distances from both JVE explosions, and with regard to which the sides shall exchange archival seismic recording material on historic explosions, characteristics of the stations and of their seismic equipment, as well as seismic recording material of both JVE explosions.

### III. Data on Seismic Recordings and Average Network Magnitudes of the JVE Explosions Subject to the Exchange

1. Recordings of short period seismic signals of the JVE explosions, including a segment of the recording with the duration of 30 minutes after the P-wave arrival and a 1 minute recording segment preceding the arrival of the P-wave.

2. Results of calibration of seismic channels in accordance with the practice adopted at the stations of the sides and conducted within three days before and three days after the recording of each JVE explosion. Data on channel calibration shall be provided to enable the conversion of the recorded signal to absolute ground displacement in nanometers.

For the purposes of documenting, graphical representation of the recorded material on a paper medium shall be provided in addition to a copy of the recording on the medium originally used.

3. Average network magnitude for longitudinal waves and its root mean square error with an accuracy of 0.01 magnitude units, to be calculated on the basis of the data from the five designated teleseismic stations and other teleseismic stations to be chosen by each side at its own discretion as a network for determining the average network magnitude.

4. The calibration function used in calculations.

## IV. Timing and Procedure for the Exchange of Data

| Date | Activity |
|---|---|
| 10 days after each JVE explosion | Exchange of seismic recordings, data on magnitude, and on calibration pursuant to Section III of this document |

The exchange of data shall be carried out simultaneously. The data shall include the necessary textual explanations containing exhaustive information with regard to the adequacy of the composition and volume of those data to the requirements in this document concerning those data. The submitted data exchanged shall be signed by the Head of Delegation.

## V. Documentation of the Exchange

After the exchange, each side shall be able to receive clarifications on questions related to the data provided.

Based on the results of the exchange the sides shall prepare a document summarizing the nature of the information provided in the course of the exchange. This document shall be signed by the Heads of Delegation.

The exchange shall take place in Geneva, Switzerland.

# 6. PROCEDURE FOR DATA EXCHANGE AND DISCUSSION OF THE RESULTS OF THE JVE EXPLOSION YIELD DETERMINATION DERIVED THROUGH SEISMIC MEASUREMENTS

## I. Introduction

To provide an opportunity for determining explosion yields, the sides will discuss data and results obtained by teleseismic measurements during the JVE.

## II. Initial Data Available For Use in Analysis

Each side will provide the other side the following data:

1. Historic explosion yield values.
2. Seismic recordings of historic and JVE explosions, and the results of their processing in accordance with document No. 2, "Designated Teleseismic Stations."
3. Network magnitudes of historic and JVE explosions.
4. Conditions of conducting the historic and JVE explosions.
5. Standard yields of the JVE explosions as measured by hydrodynamic methods in the emplacement hole.

III. Discussing the Basic Procedures of Teleseismic Yield Measurement Methods Proposed by Either Side.

In accordance with the Agreement Between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment, the sides will discuss the basic procedures of teleseismic yield measurement methods proposed by either side. In examining the JVE results no national technical means of either side will be discussed.

1. Procedures for determining the seismic magnitude of an explosion:

a. determination of station corrections and their uncertainties for the adopted calibration function;

b. calculation of the average network magnitude of the explosion and its uncertainty;

c. procedure for exclusion of gross magnitude estimates at individual seismic stations.

2. Procedures for establishing dependencies between explosion yield and the parameters of elastic ground motion for explosions at the Nevada and Semipalatinsk test sites:

a. procedures for taking into account device emplacement depth and basic physical properties of rock in the explosion region;

b. procedures for taking into account the actual seismic efficiency of the explosion.

3. The use or non-use or discussion of specific procedures of teleseismic methods as a part of the JVE shall not establish a precedent for requiring or rejecting such procedures as a condition for agreement on measures permitting effective verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

IV. Form of Presenting the Results

Each side shall prepare a document summarizing its data and results, in accordance with document No. 2, "Designated Teleseismic Stations," obtained during the JVE using the designated teleseismic stations and other teleseismic stations, to be chosen by each side at its discretion as a network for determining an average network magnitude for the JVE explosions.

V. Timing and Procedure for Presenting and Discussing the Results

| Date | Activity |
|---|---|
| No later than 1 month after the second JVE explosion | Exchange and discussion of the documents specified in Section IV. |

The exchange of documents shall be carried out simultaneously. The results shall include the necessary textual explanations and shall be signed by the Head of the Delegation.

The discussion of results shall take place in Geneva, Switzerland.

## 7. KEY ISSUES CONCERNING THE CONFIGURATION OF THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

1. The sides have reached mutual agreements on the key questions concerning the configuration of the JVE at the Semipalatinsk Test Site and at the Nevada Test Site.

2. The objectives of the experiment; the test sites, number, and yields of the nuclear explosions; and the configuration of hydrodynamic measurements in the satellite and emplacement holes for the JVE are detailed in the Agreement between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment.

3. The sides note that design procedures of the JVE configuration shall not establish a precedent for requiring similar design procedures in the two sides' future tests as a condition for agreement on measures permitting effective verification of the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests. The Soviet side states that it will not propose any hydrodynamic methods for discussion. Discussion of hydrodynamic methods which are proposed by the United States for future verification will not mean in itself an official endorsement by the Soviet Union of those methods being discussed.

4. Other procedures either used or not used as a part of the JVE shall not establish a precedent for requiring or rejecting such possible procedures as a condition for agreement on measures permitting effective verification of the two sides' future nuclear tests in accordance with the 1974 Treaty on the Limitation of Underground Nuclear Weapon Tests.

5. Each side will provide training and experience with the hydrodynamic yield measurement system used by that side to members of the other side, in order to permit efficient resolution of differences in the data obtained by the sides, should they occur.

6. Key issues that affect the configuration of the JVE but are not addressed in the Agreement between the United States of America and the Union of Soviet Socialist Republics on the Conduct of a Joint Verification Experiment follow:

6.1 Both sides shall conduct at their test site studies of anti-intrusive measures for hydrodynamic measurements in the satellite holes in order to develop non-intrusive methods for verifying compliance with the threshold limit for nuclear weapon tests.

6.2 The sides shall evaluate the effectiveness of proposed anti-intrusive measures and shall use agreed organizational and technical procedures for ensuring protection of sensitive information.

6.3 The emplacement holes and the test configuration shall be sufficiently characteristic of the emplacement holes and test configurations used by the host side to meet the objectives of the JVE, although the sides note that subsequent nuclear tests conducted by the sides may differ from the configuration of the JVE tests in view of different parameters of emplacement holes, device canisters, and the presence of a diagnostic canister.

6.4 For the purposes of the JVE, the satellite hole at each test site shall be located at a distance of 11 plus or minus 3 meters from the emplacement hole in the hydrodynamic measurement zone.

6.5 The canister for the JVE at the Nevada Test Site shall have the dimensions:

Length: 1.7 meters
Diameter (outside): 2.24 meters

6.6 The canister for the JVE at the Semipalatinsk Test Site shall have the dimensions:

Length: 1.7 meters
Diameter (outside): 0.82 meters

6.7 Both sides may use a line-of-sight pipe penetrating the lid of the nuclear device canister with dimensions:

Length: 2.2 meters or less
Diameter (outside): 0.127 meters or less

6.8 The Soviet side states its concern that the accuracy of its hydrodynamic yield measurements in the emplacement hole could be degraded for the U.S. JVE canister dimensions unless it can be established that the large void spaces within the canister have not been filled with tamping materials. The U.S. side states that the accuracy of its hydrodynamic yield measurements in the emplacement hole, is not degraded for the U.S JVE canister dimensions. The sides note that the accuracy of the hydrodynamic yield measurements in the satellite hole will not be affected by the canister design of either side.

To address the Soviet side's stated concern on emplacement hole yield measurements, the U.S. side shall:

6.8.1 Provide drawings to the Soviet side showing the dimensions and materials of the canister assembly and canister lid assembly less nuclear device and related hardware, and the diagnostic rack assembly;

6.8.2 Under the observation of Soviet designated personnel, weigh the canister assembly and canister lid assembly less nuclear device and related hardware, and the diagnostic rack assembly before installation of the nuclear device and related hardware;

6.8.3 Under the observation of Soviet designated personnel, label the above weighed components in a permanent manner;

6.8.4 After installation of the nuclear device and related hardware in the absence of Soviet designated personnel, weigh these assembled components in the presence of Soviet designated personnel.

6.8.5 Proceed with the downhole operation under the continued observation of Soviet designated personnel.

6.8.6 The U.S. side has no concerns for the accuracy of emplacement hole hydrodynamic measurements for the Soviet JVE canister dimensions, and no procedures for determining the weight or average density of the Soviet JVE canister are required.

6.9 The host side shall provide the visiting side a zero time signal for the JVE explosion accurate to plus or minus 1 microsecond at the Nevada Test Site and plus or minus 0.5 microseconds at the Semipalatinsk Test Site.

6.10 The sides shall record and compare the timing standards for each side's measurements.

6.11 The sides agree that the measurement hole drilled by the Soviet side at the JVE location at the Semipalatinsk Test Site has no function related to the agreed objectives of the JVE but may be used for other purposes by the Soviet side, provided that all preparations, including sensor installation and subsequent stemming of this hole are carried out under observation by representatives of the U.S. side, and that such use does not interfere with the conduct of the JVE.

## 8. TECHNICAL REQUIREMENTS OF THE SOVIET SIDE FOR CONDUCTING HYDRODYNAMIC MEASUREMENTS DURING THE JVE AT THE NEVADA TEST SITE

1. Geological, hydro-geological, and geophysical information provided to the Soviet side.

1.1 Information on the geological and hydro-geological conditions specifying geophysical properties of surrounding rock present in the explosion region delineated by a vertical cylinder whose axis passes through the explosion point, and with a radius equal to the device emplacement depth and height from the surface equal to double emplacement depth, including:

1.1.1 Stratigraphic column.

1.1.2 Lithological column specifying the thickness and depth of strata.

1.1.3 Geological description of rock formations.

1.1.4 Basic physical properties of rock:

a. bulk density;
b. particle density;
c. porosity;
d. water content in the pores (based on samples heated to no more than 110 degrees C);
e. water saturation;
f. specific electric resistance;
g. velocity of P- and S-waves;
h. chemical composition;
i. available data on the strength and deformation properties of rock.

1.1.5 Water table level.

1.1.6 Information on any known geological and geophysical heterogeneity of the medium.

1.2 Sources of geological and geophysical information shall be the results of laboratory and geophysical logging operations in the emplacement and satellite holes for hydrodynamic and seismic measurements. Data received from any other holes drilled in the area where the hole is located may be added to this information.

If no direct geological and geophysical measurements of the zone below the device emplacement level are available, geological and geophysical information with regard to this zone can be provided in the form of a geological and geophysical forecast, in accordance with document No. 4, "Procedure for Exchanging Geological and Geophysical Information on the JVE Explosion Areas, Including Logging of the Emplacement Hole, in the Interest of the Seismic Method."

1.3 All logging and coring operations in the emplacement and satellite holes shall be conducted in accordance with documents No. 11, "Core Sampling Procedure;" No. 13, "Responsibilities of the U.S. and the USSR Sides with Regard to Coring of the Emplacement and Satellite Holes and Drilling of the Satellite Hole at the Nevada Test Site;" and No. 15, "Logging Operations in the Emplacement and Satellite Holes in Preparation for the JVE at the Nevada Test Site and Semipalatinsk Test Site."

2. Emplacement and Satellite Holes.

2.1 The emplacement hole is determined by a shaft selected for the JVE at NTS (depth 670 meters diameter 2.44 meters).

2.2 The satellite hole shall be drilled in such a way that the distance between its axis and the axis of the emplacement hole in the hydrodynamic measurement zone (minus 30 to plus 150 meters from the center of explosion) shall be 11 plus or minus 3 meters. The diameter of the satellite hole shall be 311 millimeters, depth of the bottom point shall be no less than 655 meters.

2.3 No casing shall be permitted in the hydrodynamic zone of the emplacement and satellite holes.

2.4 Directional survey of the emplacement and satellite holes and mutual geometrical referencing shall be conducted in accordance with documents No. 13 and No. 15

2.5 The operational diagram of the actual spatial location of the axis of the satellite hole relative to the axis of the emplacement hole in the 0 -- plus 70 meter depth range shall be provided, indicating absolute values for distance, depth, and error of relevant measurements. The operational diagram shall include the planned location of the explosion center (based on the emplacement hole depth), the actual length of the trajectory of the satellite hole from the top to the point where its axis is at minimum distance from the explosion center, and the trajectory length from top to bottom.

2.6 The actual depth of the explosion center shall be provided after the emplacement of the nuclear device and sensors, together with a statement of the accuracy of this measurement.

2.7 In addition to the logging operations carried out in accordance with document No. 15, geometrical characteristics and the state of the walls and bottom of the emplacement hole in the hydrodynamic zone shall be monitored by television observations and photographs in the presence of Soviet designated personnel with U.S. equipment, with subsequent provision of relative photographs to the Soviet side.

3. Requirements for Preparing Working Areas

3.1. At a distance of 20 to 40 meters from the emplacement hole (preferably in the direction of the top of the satellite hole) a temporary instrument shack approximately 8.5 x 3.5 x 3 (h) meters shall be erected for purposes of preparing the emplacement of measurement devices into the emplacement and satellite holes. The shack shall be supplied with power, lights, grounding, possibility to be placed under guard (surveillance) and fire protection measures. The shack will be used by the Soviet designated personnel as a working facility and a place for brief rest. The U.S. side shall ensure for the Soviet designated personnel the possibility to have access to the shack 24 hours a day throughout the entire period of emplacement and stemming operations, and shall supply the shack with bottled drinking water. Prior to the explosion the shack shall be dismantled by the U.S. side.

3.2 At a distance of 10 to 20 meters from the shack (in a direction away from the holes) three cylindrical metal containers (diameter 2.4 meters, height 2.4 meters) are to be provided for the purposes of calibrating gamma density probes. Along the axis of each container a section of the emplacement pipe (diameter 139.7 millimeters) extending one meter above the top edge of the container shall be installed and filled with stemming material. A platform of wooden boards shall be installed at the level of the upper edge of the containers (for the convenience of access and operations by the personnel). One container shall be filled with industrial water. The method of filling the container with water and removing water from the container shall be determined by the U.S. side.

The other two containers shall be filled with pourable stemming materials with different specific density, which will be used for stemming the emplacement hole (for example, garnet and silicate sands). The acceptable error in determining the density of the stemming material by weighing and measuring its volume shall be plus or minus 2 percent.

The Soviet side shall provide the Co-60 sources in protective containers near which personnel may remain for unlimited periods of time.

3.3 Near the instrument shack (see para. 3.1) in a convenient location (not interfering with its subsequent dismantling) metal cable boxes no. 1 and 2 with dimensions no less than 1 x 0.5 x 0.5 meters shall be placed for the installation of IP and DRK adapters supplied by the Soviet side.

3.4 The SG112A1 instrumentation complex of the Soviet side shall be located approximately 510 meters from the emplacement hole and about 680 meters from the U.S. trailer park. This instrumentation complex shall be installed in accordance with document No. 21, "Trailer Park Equipment for the Conduct of JVE at the Nevada Test Site and Semipalatinsk Test Site." In order to reduce the effect of the explosion down to accelerations not exceeding 4g, the U.S. side shall provide a shock mitigating device for the installation of the Soviet side's

instrumentation complex removed from its chassis (dimensions without chassis 7.7 x 3.1 x 3.1 meters, weight 6.9 tons). Moreover, the U.S. side shall provide for the measurement of the actual overload both on the ground surface at the point where the shock mitigating platform for the instrumentation complex of the Soviet side is located and on the body of the complex itself. The results of the measurements shall be given to the Soviet side after the explosion.

3.5 Power supply to the SG112A1 instrumentation complex shall be provided by Diesel power stations supplied by the U.S. side, which shall ensure a supply of 3-phase 380/220 volt, 50 Hertz, 20 kilowatt power throughout the entire period of preparation and conduct of the experiment up until plus 2 hours after the explosion.

3.6 In accordance with the mutually agreed document, provisions shall be made for the delivery of command signals to the SG112A1 instrumentation complex and for the reception of monitor signals from it.

4. Cable Installation.

4.1 In accordance with the mutually agreed document, the Soviet side shall supply and install initial sections of cables leading from the contact switches and density probes.

4.2 Starting with the markings indicated in Table I (see Table I), MIZ cables, as well as cables for contact switches and density probes, shall be supplied by the U.S. side. The installation of these cables shall be performed in accordance with the mutually agreed document.

4.3 Table I provides an overall listing of cable lines.

4.4 For ease of observation and possible repair, measurement cables of the Soviet side shall be installed on the ground along a separate route away from the top of the holes, to the cable boxes and from there to AK SG112A1.

All cables marked in Table I as SU-1 to SU-31 shall be labeled at both ends with metal (or other) tags (durable under working conditions).

4.5 Insulation resistance of cables, disconnected on both ends from the instruments and measured with a 1000 volt Megohmmeter, shall be no less that 100 Megohms per kilometer.

4.6 Cable of the Soviet side should be protected from mechanical damage during preparatory operations as well as from thunderstorms and fires.

5. Preparatory Operations

5.1 Installation of contact switches, pin strings, brackets for density probes and signal conditioning units shall be carried out on assembled pipes of the emplacement column held vertically. It would be desirable to have a fully assembled section with a length that would correspond to the total interval along which the switches are to be emplaced. For the emplacement hole this length is 35 meters (from 7 to 42 meters, counting from the center of detonation); for the

satellite hole it is 62 meters (from minus 15 to plus 47 meters).

Assembly of the section in maximum length segments rather than in its entirety shall be permissible.

For the satellite hole, pin strings and MIZ cables shall be attached when the pipe column is in a vertical position in process of being lowered.

5.2 During the process of lowering the pipe column down the emplacement hole, density probes containing cobalt sources shall be attached to support brackets supplied by the Soviet side as corresponding marks approach the top of the hole.

Mounting devices (support brackets) for contact switches in the emplacement hole shall be supplied by the U.S. side, and for those in the satellite hole by the Soviet side. CORRTEX and MIZ sensor cables shall be attached together to standard support brackets of the U.S. side. The multiplexors shall be installed on brackets supplied by the Soviet side.

5.3 Displacement of points of attachment of sensors relative to their calculated position, due to the presence of couplings, centralizers, or other technological features, is acceptable.

Calculated sensor locations are indicated on the block diagram of measurements given to the U.S. side.

5.4 Measurements of distances to sensors (cable-sensors) shall take place in accordance with the mutually agreed document.

5.5 The U.S. side shall supply and install terminators on MIZ sensor-cable ends. Connectors for joining RK75-9-13 cables of the Soviet side to RF-14 cables of the U.S. side shall be supplied by both sides (for independent selection at the point of utilization).

6. Emplacement and Stemming

6.1 Measuring equipment of the Soviet side to be lowered into the emplacement hole is listed in Table II.

6.2 Equipment (for measurements of the Soviet side) to be lowered into the satellite hole is listed in Table III.

6.3 Hole emplacement procedures shall be carried out with equipment of the U.S. side in accordance with U.S. technique in the presence and with participation of designated personnel of the Soviet side.

6.4 The stemming of the holes shall be conducted in accordance with document No. 20, "Stemming of the Emplacement and Satellite Holes during the Conduct of the JVE at the Nevada Test Site and Semipalatinsk Test Site."

7. General Requirements

7.1 U.S. side shall render, as needed and in the amount agreed upon by respective leaders, technical assistance to the designated personnel of the Soviet side during preparation and conduct of the JVE.

7.2 Vehicles, loading equipment, work safety devices, fuel and lubricants, power, work facilities, etc. shall be provided in accordance with the mutually agreed documents.

LIST OF CABLE LINES (Table I)
Emplacement Hole

| Cable Designation | Line Specification Beginning | End | Number of Lines | Cable Type | Supplier |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| MIZ-1,2 | +7m mark | +77 m mk *L=64m | 2 | RF-214 | US |
| SU-1,2 | +77m mk. | AK SG112A1 | 2 | RF-14 | US |
| DRK-1,3 | +7m mk. (+12m) | +77m mk. | 2 | KG7-70-90 | USSR |
| DRK-2,4 | +9m mk. (+12.5m) | +77m mk. | 2 | KG7-70-90 | USSR |
| SU-3,4,5,6 | +77m mk. | cable box #1 | 4 | MR-44 | US |
| SU-7,8 | cable box #1 | AK SG112A1 | 2 | RF-14 | US |
| RK-1 | +32 mk. | +77m mk. | 1 | RK75-9-13 | USSR |
| RK-2 | +40m mk. | +77m mk. | 1 | RK75-9-13 | USSR |
| SU-9,10 | +77m mk. | AK SG112A1 | 2 | RF-14 | US |
| IP-1 | -2.5m mk. | +12m mk. | 1 | RK75-9-13** | USSR |
| IP-2 | +2.5m mk. | +12m mk. | 1 | RK75-9-13 | USSR |
| IP-3 | +8m mk. | +12m mk. | 1 | RK75-9-13 | USSR |
| IP-4 | +10m mk. | +12m mk. | 1 | RK75-9-13 | USSR |
| IP-5 | +20m mk. | +52m mk. | 1 | RK75-9-13 | USSR |
| IP-6 | +35m mk. | +52m mk. | 1 | RK75-9-13 | USSR |
| IP-7 | +50m mk | +52m mk. | 1 | RK75-9-13 | USSR |
| IP-01 | +12m mk | +77m mk. | 1 | KG7-70-90 | USSR |
| IP-02 | +52m mk | +77m mk. | 1 | KG7-70-90 | USSR |
| SU-11,12 | +77 m mk | cable box #2 | 2 | MR-44 | US |
| SU-13,14 | cable box #2 | AK SG112A1 | 2 | RF-14 | US |

## Satellite Hole (Table I)

| Cable Designation | Line Specification Beginning | End | Number of Lines | Cable Type | Supplier |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| MIZ-3 | -15m mk. | +55m mk. *L=88m | 1 | RF-214 | US |
| MIZ-4 | -5m mk. | +56m mk. *L=73m | 1 | RF-214 | US |
| SU-20 | +55m mk. | AK SG112A1 | 1 | RF-14 | US |
| SU-21 | +56m mk. | AK SG112A1 | 1 | RF-14 | US |
| RKD-1 | +15m mk. | +16m mk. | 1 | RK75-9-13 | USSR |
| SU-22 | +16m mk. | AK SG112A1 | 1 | RF-14 | US |
| RKD-2 | +25m mk. | +26m mk. | 1 | RK75-9-13 | USSR |
| SU-23 | +26m mk. | AK SG112A1 | 1 | RF-14 | US |
| RKD-3 | +47m mk. | +48m mk. | 1 | RK75-9-13 | USSR |
| SU-24 | +48m mk. | AK SG112A1 | 1 | RF-14 | US |

## Trailer Park (Table I)

| Cable Designation | Line Specification Beginning | End | Number of Lines | Cable Type | Supplier |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| SU-25 | Diesel Power Unit | AK SG112A1 | 1 | $3x50mm^2$+ $1x16mm^2$ | US |
| SU-26,27 | Timing & Control Trailer | AK SG112A1 (Commands, command execution) | Types of cables and responsibility for supplying them are specified in a separate document. | | |
| SU-28,29 | Timing & Control Trailer | AK SG112A1 Pre-fiducial signal | Types of cables and responsibility for supplying them are specified in a separate document. | | |
| SU-30,31 | Timing & Control Trailer | AK SG112A1*** Fiducial Signal | Types of cables and responsibility for supplying them are specified in a separate document | | |

*Cable length (L) is given with length of loops taken into consideration.

** Cable extending from the lower density probe is replaced in the -1m to +7m range with a U.S. cable, passing through the canister.

*** The signal is to arrive at the moment of nuclear explosion with an accuracy of ±1.0 microseconds; signal parameters are the same as for the pre-fiducial signal specified in document No. 18, "Command and Monitor Signals for the JVE."

Emplacement Hole Equipment (Table II)

| Item No. | Designation | Dimensions | Weight per unit (kg) | Number of items |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1. | IP Density probe | ϕ 55mm L=620mm | 2.5 | 7 |
| 2. | Cable to each density probe | ϕ 12.2mm L=11m (RK75-9-13) | 1.8 | 7 |
| 3. | Cable to density probe group | ϕ 12.3mm L=40m (KG7-70-90) | 21 | 2 |
| 4. | In-hole cable from density probes | ϕ 16mm L=600m (MP-44) | ...* | 2 |
| 5. | MIZ sensor-cable | ϕ 11mm L=70m (RF-214) | ... | 2 |
| 6. | In-hole cable from MIZ sensors | ϕ 16mm L=600m (RF-14) | ... | 2 |
| 7. | DRK logging cable sensors (together with the cable itself) | Support brackets (design under development) | 10 | 35 |
| | | KG7-70-90 cables ϕ 12.3mm L=70m | 36 | 4 |
| 8. | In-hole cables from logging cable & multiconductor cable connections (+77m) | ϕ 16mm L=600m (MP-44) | ... | 4 |
| 9. | Contact switches on an RF cable and cables from signal conditioning box to +77m mark | Support brackets together with the DRK cable (see above) cables RK75-9-13 | ------ | ----- |
| | | ϕ 12.2m L=30m | 5.0 | 50 |
| 10. | Signal conditioning box from RF cable | ϕ 150mm L=300mm | 15 | 2 |
| 11. | In-hole cables leading from RK75-9-13 connection with the U.S. coaxial cables (+77m mark) | ϕ 16mm L=600m (RF-14) | ... | 2 |

Total weight of Soviet equipment is 850 kg.

*Total weight and mass per unit length of U.S. cables is known to the U.S. side.

## Satellite Hole Equipment (Table III)

| Item No. | Designation | Dimensions | Weight per unit (kg) | Number of items |
|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 |
| 1. | RKD contact switch pin string | ϕ 42mm, L=30m | 250 | 3 |
| 2. | Cable from RKD | ϕ 12.2mm, L=1m | 0.17 | 3 |
| 3. | In-hole cable from connection point with RK75-9-13 (RKD) | ϕ 16mm, L=600m (RF-14) | ...* | 3 |
| 4. | MIZ sensor-cable | ϕ 11mm L=60m (RF-214) | ... | 2 |
| 5. | In-hole cable from connection point with RF-214 | ϕ 16mm L=600m (RF-14) | ... | 2 |
| 6. | Support brackets for RKD strings | Dimensions not to exceed dimensions of string | 0.3 | 27 |

Total weight of Soviet equipment is 760 kg.

*Total weight and mass per unit length of U.S. cables is known to the U.S. side.

## 9. TECHNICAL REQUIREMENTS OF THE U.S. SIDE FOR CONDUCTING HYDRODYNAMIC MEASUREMENTS DURING THE JVE AT THE SEMIPALATINSK TEST SITE

1. Data to be given to the U.S. side.

1.1 The Soviet side shall provide information on the geological and hydro-geological conditions specifying geophysical properties of surrounding rock present in the explosion region delineated by a vertical cylinder whose axis passes through the explosion point, and with a radius equal to the device emplacement depth and height from the surface equal to double emplacement depth.

For the depth range from the surface to the bottom of the hole, this information shall be based on data taken directly from the emplacement and satellite holes, verified in accordance with Section 1.2 of this document, and supplemented as needed by data from any other holes drilled in the area of the emplacement hole.

For the depth range below the bottom of the hole, if no direct geological and geophysical measurements are available, information for this zone may be provided in the form of a geological and geophysical forecast, in accordance with document No. 4, "Procedure for Exchanging Geological and Geophysical Information on the JVE Explosion Areas, Including Logging of the Emplacement Hole, in the Interest of the Seismic Method."

Data to be given to the U.S. side shall include description of the following geological conditions and rock properties:

1.1.1 A general geological description of the explosion region.

1.1.2 A stratigraphic column including a lithological description of each rock formation, its depth and thickness, from the bottom of the hole to the surface.

1.1.3 The measured depth of the standing water level or estimated depth to the water table.

1.1.4 Information on any known geophysical discontinuities.

1.1.5 A geophysical description of the rocks identified in the stratigraphic column, which shall include the following properties:

a. bulk density
b. grain density
c. pore water content (from samples that have not been heated to more than 110 degrees C)
d. degree of liquid saturation
e. porosity
f. longitudinal and shear wave velocities
g. chemical composition
h. available data on rock strength

1.2 The description provided in accordance with subsection 1.1 of this document shall be verified by data obtained in the course of logging and coring activities associated with both the emplacement and satellite holes.

1.2.1 A full suite of logs shall be required in both holes, sufficient to:

a. determine hole size and roughness and hole location as a function of depth;
b. determine in-situ density, longitudinal velocities, and electrical resistivity of the rock;
c. verify the stratigraphic column and the lithologies of rocks in the emplacement hole and in the satellite hole, from the bottom to the surface;
d. correlate the stratigraphy between holes as a guide to the process of taking core from the satellite hole and to verify the quality and position of core taken from the emplacement hole.

1.2.2 All logging data, including data from calibrations to be taken before and after the borehole measurements, shall be duplicated and complete copies shall be distributed to both sides for their own use. The calibration data shall include all information required to relate the instrument response at the operating location to mutually acceptable engineering standards.

1.2.3 Core samples, taken in accordance with the procedures specified in document No. 11, "Core Sampling Procedure," and document No. 12, "Procedure for Coring and Transferring Cores from the Hydrodynamic Zone of the Emplacement Hole at the Semipalatinsk Test Site Designated for the JVE," shall be given to U.S. designated personnel. The Soviet side shall facilitate the removal of these samples from the territory of the USSR for laboratory testing in the U.S.

1.2.4 Depending upon available core samples and conditions, additional core samples may be required, to be obtained by the U.S. side from the sidewall using its own equipment.

1.2.5 The logging and coring activities shall be carried out on an agreed upon schedule in accordance with documents No. 11, No. 12, and No. 15, "Logging Operations in the Emplacement and Satellite Holes in Preparation for the JVE at the Nevada Test Site and Semipalatinsk Test Site."

1.3 After the nuclear device and sensors have been emplaced, the actual depth of the center of the explosion shall be submitted to the U.S. side, together with a statement of the accuracy of this measurement.

2. Emplacement and Satellite Hole Specifications

2.1 The emplacement hole is nominally a vertical right circular cylinder; the specific design is determined by the stockpile hole selected for the JVE at the Semipalatinsk Test Site.

2.2 The satellite hole shall be drilled such that, at the point along its axis minimally distant from the center of the explosion, the spacing between its centerline and that of the emplacement hole shall be 11 plus or minus 3 meters, and in the hydrodynamic measurement zone (minus 30 to plus 100 meters from the center of the explosion) its axis shall be as straight and as parallel to the emplacement hole as possible.

The nominal diameter of the satellite hole shall be 311 millimeters, and its bottom should be at least 33 meters below the planned depth of the center of the explosion.

2.3 In the hydrodynamic measurement zone the emplacement and satellite holes shall be uncased.

2.4 Logging and coring operations in the emplacement and satellite holes shall be conducted in accordance with documents No. 11, No. 12, and No. 15.

2.5 Directional surveys of the emplacement and satellite holes shall be performed by the U.S. side, using its equipment, and under the observation by and with the cooperation and assistance of Soviet personnel. Directional surveys may also be performed by the Soviet side, using its equipment, and under the observation by U.S. designated personnel.

2.6 Verification of the geometric parameters of and the state of the bottom and walls of the emplacement hole in the hydrodynamic measurement zone shall be carried out by the Soviet side, using the best procedures and equipment available at the Semipalatinsk Test Site for this purpose, in the presence of U.S. designated personnel. Documentation of these procedures shall be delivered promptly to the U.S. side.

3. Site Preparation Requirements

3.1 The U.S. Recording Station (Container P-15-301 or P-15-302) shall be set up at a distance of approximately 1000 meters from the emplacement hole well-head and at a distance of about 1500 meters from the Soviet trailer park containing recording equipment, in accordance with document No. 21, "Trailer Park Equipment for the Conduct of JVE at the Nevada Test Site and Semipalatinsk Test Site." The Soviet side shall provide a suitable graded and level pad for this station. The container shall be moved to this location on its flat-bed trailer by a Soviet tractor. The container shall then be removed from its trailer and emplaced on a shock mitigation frame to be supplied by the U.S. side. (The weight of the container and its contents will be approximately 9000 kilograms, its dimensions 6.7 meters long by 2.5 meters wide by 2.5 meters high. The frame is 8.5 meters long by 6.4 meters wide by 0.5 meters high and weighs approximately 7200 kilograms.) The U.S. side will also supply shock mitigation material suitable for isolation from a ground shock of 30 to 40 g (values based on Soviet furnished information). Instructions for the installation of the shock mitigation material and assembly of the frame will be provided by the U.S. side. The mounted container, termed the U.S. Recording Station, shall be supplied with electrical power, exterior lighting, local communications line, lightning protection, and a ground connection with impedance less than 10 ohms.

The graded and level pad for the U.S. Recording Station shall include a 5 meters by 12 meters all-weather parking area (well-drained gravel surface) able to support the U.S. Mobile Work Station (weight 6800 kilograms).

3.2 In or near the Soviet command point, the Soviet side shall make available a trailer or room (at least 16 square meters in area) for the exclusive use of the U.S. side for monitoring and control of the U.S. Recording Station and for retrieving the data post event. This facility, the U.S. Monitor and Control Facility, shall be supplied with electrical

power, lighting, heating and cooling, and communications. Equipment in this facility will include the command computer and the fiber optic transmission system linking the facility with the U.S. Recording Station.

3.3 At a distance of 15 to 20 meters from the emplacement hole well-head, in the vicinity of the satellite hole, a temporary instrumentation shack (approximately 2.5 meters wide by 6.0 meters long by 2.5 meters high) shall be erected by the Soviet side. This structure will be needed for readying measurement instrumentation to be installed in the emplacement and satellite holes, and shall be provided with utility power, lighting, fire fighting equipment, heating and cooling, communication equipment, and the means to secure the facility. A parking area adjacent to this shack similar to that at the U.S. Recording Station shall be provided.

Prior to the explosion this temporary shack shall be removed by the Soviet side at the request of the U.S. side.

3.4 At the U.S. Recording Station, the Soviet-supplied power shall be 3-phase, 380 Volt, 50 Hertz, at 50 kilovolt-amperes; this utility power will drive a U.S.-supplied frequency converter to provide 60 Hertz power to the station. The Soviet side shall emplace this frequency converter (weight 2800 kilograms) on a host-furnished trailer or skid, and place it in the near vicinity of the U.S. Recording Station. The Soviet side shall remove this frequency converter to a safe distance from ground zero at the latest possible time prior to the explosion. (The station will be left on internal power.)

At the U.S. Monitor and Control Facility, the Soviet side shall furnish 10 kilovolt-amperes of 380 Volt, 50 Hertz, 3-phase electrical power.

At the temporary instrument shack, the Soviet side shall provide 5 kilovolt-amperes of 220 Volt, single-phase, 50 Hertz electrical power. The Soviet side shall provide a suitable pad for the U.S. frequency converters at each of the three locations.

3.5 In accordance with document No. 18, "Command and Monitor Signals for the JVE," provisions shall be made for the delivery of command and monitor signals to the U.S. Recording Station (hydrodynamic recording instrumentation) and to the U.S. Monitor and Control Facility (monitoring and control system). A list of the command signals is given in Table I.

3.6 For ease of observation and purposes of protection, cableways from the surface Ground Zero to the U.S. Recording Station and from the U.S. Recording Station to the U.S. Monitor and Control Facility shall be provided. Each cableway shall be cleared, at least 3.5 meters wide, in as direct a path as the terrain will allow, and bordered on each side by a single rope barrier. Only cables used by the U.S. side shall be permitted in these cableways. Access to these cableways shall be restricted to only U.S. designated personnel or to Soviet personnel when accompanied by U.S. designated personnel.

The cableway from surface Ground Zero to the U.S. Recording Station will contain the 12 RF-14 hydrodynamic yield measurement surface cables. The cableway from the U.S. Recording Station to the U.S. Monitor and Control Facility will contain two bundles of optical fibers. Access to both cableways shall be open to U.S. designated personnel at all times to observe, monitor, or repair cables.

4. Mobile Work Station (MWS)

4.1 The U.S. side will bring to the Semipalatinsk Test Site a self-contained Mobile Work Station (MWS) (dimensions: 9.5 meters long by 2.5 meters wide by 2.6 meters high; weight: 6800 kilograms;), a gasoline-powered vehicle that will be used at the U.S. Recording Station and the temporary instrument shack as an office and work area. Equipment in the MWS will include a personal computer, with disk storage, and a computer terminal linked to the computer in the U.S. Recording Station.

4.2 The Soviet side shall provide a driver or escort on request by the U.S. side to position the MWS at the desired area, and to remove the vehicle to a safe rear location before detonation time.

4.3 The Soviet side shall provide motor fuel, liquified petroleum gas (propane - for heating and refrigeration), and bottled drinking water for the MWS.

4.4 The Soviet side shall make provisions for U.S. designated personnel to have access to the MWS on a 24-hour per day basis after sensor cables have been installed downhole.

5. Preparation and Installation of Sensors

5.1 U.S.-supplied hydrodynamic yield measurement sensor cables will be laid out, have signature loops installed, calibrated, and otherwise made ready for emplacement hole installation in the immediate vicinity of the U.S. Recording Station. Designated personnel of the U.S. side will perform these operations, under the observation of Soviet personnel. This work will be carried out in the U.S. cableway (see Paragraph 3.6) in the zone from about 15 meters away from the emplacement hole to about 115 meters away from the emplacement hole. Along this 100 meter zone, the cableway should be widened to at least 7 meters, and its surface should be treated to provide a stable, mud-free, well-drained working surface. The completed sensor cables will be kept under the care and custody of U.S. designated personnel until the downhole operation.

5.2 The U.S. side will fabricate and furnish support brackets for those U.S. hydrodynamic yield measurement sensor cables installed in the device emplacement hole, using Soviet-supplied specifications regarding the emplacement pipe dimensions. These brackets will be installed on assembled emplacement pipe sections during the downhole operation. The dimensions of the support brackets will be such as to place the U.S. hydrodynamic yield measurement sensing cables near to the walls of the emplacement hole without unduly interfering with the downhole emplacement, in accordance with document No. 10, "Configuration of Hydrodynamic Measurements in the Emplacement and Satellite Holes at the Nevada Test Site and Semipalatinsk During the Conduct of the JVE." The brackets shall also be suitable for supporting Soviet hydrodynamic yield sensor cables.

5.3 Displacement of points of attachment of the sensor cable support brackets from agreed-upon design positions due to the presence of couplings, centralizers, or other necessary technology features is acceptable.

Design points for support bracket installation are indicated on the diagram given to the Soviet side.

5.4 The U.S. hydrodynamic yield measurement sensor cables shall be mounted to the support brackets on the emplacement pipe by U.S. designated personnel in the presence of and with the cooperation of Soviet personnel. The U.S. hydrodynamic yield measurement sensor cables shall be attached to the support brackets during the process of lowering the emplacement pipe assembly into the device emplacement hole. Signature loops in the U.S. hydrodynamic yield measurement sensor cables may be installed by U.S. designated personnel during this process. Cooperative control of this downhole process by both sides is essential.

Relative placement of U.S. and Soviet sensor cables and switches shall be as described in agreed-upon documents. Cable runs for U.S. cables in the emplacement hole are described in Table II.

5.5 For the satellite hole, U.S. hydrodynamic yield measurement sensor cables shall be affixed to the U.S.-furnished fiberglass-reinforced-plastic (FRP) pipe (3.51-inch diameter) by banding or taping; this process will be performed by U.S. designated personnel, in the presence of and with the cooperation of Soviet personnel. Cable layout, following agreed-upon documents, is described in Table III. Attachment of the sensing cables to the FRP pipe will take place with the pipe in the vertical position as it is being lowered into the satellite hole. Signature loops in the U.S. hydrodynamic yield measurement sensor cables may be installed by U.S. designated personnel during this process. Relative placement of U.S. and Soviet sensing cables and switches shall be as described in document No. 10.

5.6 The physical positions of signature loops in the U.S. hydrodynamic yield measurement sensor cables, and similar items in Soviet cables and switches, with reference to established distance marks along the nuclear device emplacement pipe in the emplacement hole and the FRP pipe in the satellite hole, shall be measured and documented following procedures set forth in documents No. 10 and No. 17, "Supplying and Installing Sensors and Cables in Preparation for the JVE." Agreement as to measured position of each distinguishing signature item by both sides is required as the lowering procedures are taking place. Documentation in log notebooks and by photographs of each distinguishing signature item is required. Photographs requested by the U.S. side shall be taken in accordance with the provisions set forth in document No. 32, "Miscellaneous Issues Related to the Preparation and Conduct of the JVE."

6. Downhole and Stemming

6.1 U.S. measuring equipment to be lowered into the device emplacement hole is listed in Table II.

6.2 U.S. measuring equipment to be lowered into the satellite hole is listed in Table III.

6.3 Sensor mounting hardware for the emplacement and satellite holes is described in Table IV.

6.4 Lowering of equipment into the emplacement hole shall be done using Soviet equipment and personnel, in accordance with document No. 17, in the presence of and with the participation of U.S. designated personnel.

6.5 Lowering of sensors attached to the U.S.-furnished FRP pipe into the satellite hole shall be done using Soviet equipment and personnel in accordance with documents No. 16, "Responsibilities for the Preparation of Hydrodynamic Measurements in the JVE Satellite Holes," and No. 17, in the presence of and with the participation of U.S. designated personnel.

6.6 The downhole processes in both the emplacement and satellite holes shall be carried out under the joint control of both sides to ensure safe emplacement of all sensors and related devices, and complete documentation of the locations of distinguishing sensor signature items.

6.7 Stemming of the device emplacement hole in the hydrodynamic measurement zone shall be conducted in accordance with document No. 20, "Stemming of the Emplacement and Satellite Holes During the Conduct of the JVE at the Nevada Test Site and Semipalatinsk Test Site."

6.8 Grouting of the satellite hole shall be performed following procedures developed by the U.S. side in accordance with document No. 20.

7. General Requirements

7.1 Requested technical assistance to the U.S. designated personnel during preparation for and execution of the JVE shall be rendered by the Soviet side as agreed upon by the respective persons in charge.

7.2 The provision by the Soviet side of transportation, housing and food, laboratory and assembly facilities, communications, fuel and lubricants, loading and handling equipment, safety devices, electrical power, and other items required for successful execution of the JVE shall be in accordance with the provisions stipulated in agreed-upon documents covering the JVE.

TABLE I

CABLES ON THE SURFACE, REQUIRED BY THE U.S. SIDE

| CABLE DESIGNATION | FUNCTION | BEGIN | END | NUMBER OF LINES | CABLE TYPE | SUPPLIER |
|---|---|---|---|---|---|---|
| Y-1,2<br>Y-3,4<br>Y-5,6 | -15 Min Command<br>- 2 Min Command<br>- 1 Min Command | USSR Command Point | U.S. Recording Station | 10 pair | To be determined by USSR | USSR |
| X-1,2 | Fiducial | USSR Command Point | U.S. Recording Station | 2 | Coaxial | USSR |
| F-1,2 | Control/Monitor | U.S. Monitor and Control Facility | U.S. Recording Station | 2 x 3 | Optical fibers | U.S. |

TABLE II

EMPLACEMENT HOLE CABLES REQUIRED BY THE U.S. SIDE

| CABLE DESIGNATION | CABLE TYPE | BEGIN (m) | END (m) | NUMBER OF LOOPS | LENGTH (m) | DIAMETER (mm) | WEIGHT/UNIT (Kg) | NUMBER OF UNITS |
|---|---|---|---|---|---|---|---|---|
| K-1 | HJ4 | 7.0 | 100. | 0 | 93. | 15.0 | 34. | 1 |
| K-2 | RF214 | 7.0 | W.C. | 9 | 686. | 11.0 | 130. | 1 |
| K-3 | FSJ1-50 | 7.0 | 100. | 9 | 111. | 7.6 | 10. | 1 |
| K-4 | FSJ1-50 | 7.0 | 100. | 9 | 111. | 7.6 | 10. | 1 |
| K-5 | RF214 | 7.0 | W.C. | 9 | 686. | 11.0 | 130. | 1 |
| K-6 | RF14 | 7.0 | W.C. | 0 | 668. | 16.0 | 140. | 1 |
| D-1,3,4 | RF14 | 100. | W.C. | N/A | 575. | 16.0 | 121. | 3 |
| S-1,2,3,4,5,6 | RF14 | W.C. | U.S. Recording Station | N/A | 1000 | 16.0 | N/A | 6 |

NOTES:
1) Explosion point depth is 645 M.
2) Wellhead connection (W.C.) approximately 30 M from surface G.Z.
3) Downhole end of each hydrodynamic sensor cable is terminated in a shorting cap.
4) All cables are labeled at each end.
5) All connectors and cables are U.S. supplied.

TABLE III

SATELLITE HOLE CABLES REQUIRED BY THE U.S. SIDE

| CABLE DESIGNATION | CABLE TYPE | BEGIN (m) | END (m) | NUMBER OF LOOPS | LENGTH (m) | DIAMETER (mm) | WEIGHT/UNIT (Kg) | NUMBER OF UNITS |
|---|---|---|---|---|---|---|---|---|
| K-7 | HJ4 | -30. | 100. | 0 | 130. | 15. | 47. | 1 |
| K-8 | RF214 | -30. | W.C. | 9 | 723. | 11. | 137. | 1 |
| K-9 | FSJ1-50 | -30. | 98. | 9 | 146. | 7.6 | 13. | 1 |
| K-10 | FSJ1-50 | -30. | 100. | 9 | 148. | 7.6 | 13. | 1 |
| K-11 | RF214 | -30. | W.C. | 9 | 723. | 11. | 137. | 1 |
| K-12 | RF14 | -30. | W.C. | 0 | 705. | 16. | 148. | 1 |
| D-7,10 | RF14 | 100. | W.C. | N/A | 575. | 16. | 121. | 2 |
| D-9 | RF14 | 98. | W.C. | N/A | 577. | 16. | 121. | 1 |
| S-7,8,9,10, 11,12 | RF14 | W.C. | U.S. Recording Station | N/A | 1000 | 16. | N/A | 6 |

NOTES:
1) Explosion point depth is 645 M.
2) Wellhead connection (W.C.) approximately 30 M from surface G.Z.
3) Downhole end of each hydrodynamic sensor cable is terminated in a shorting cap.
4) All cables are labeled at each end.
5) All connectors and cables are U.S. supplied.

## TABLE IV

## U.S. MOUNTING HARDWARE

A. Emplacement Hole

1. Standoffs/brackets attached to emplacement pipe will support U.S. and Soviet hydrodynamic cables over the agreed upon region from +7m to +100m above explosion point. Weight of brackets and associated hardware is estimated as 12-15 brackets at 10-15 kg each.

2. Above +100m, cables will be secured to pipe with occasional clamps, a total of 50 clamps @ 0.1 kg each.

B. Satellite Hole

| | | |
|---|---|---|
| 1. | Bottom weight (Bullnose) | TBD ( 325 kg) |
| 2. | Approximate 680M of fiberglass reinforced plastic (FRP) pipe | 2500 kg |
| 3. | Centralizers and kellums | 400 kg |
| 4. | Miscellaneous | 500 kg |

10. CONFIGURATION OF HYDRODYNAMIC MEASUREMENTS IN THE EMPLACEMENT AND SATELLITE HOLES AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE DURING THE CONDUCT OF THE JVE

Semipalatinsk Test Site:

1. The Joint Verification Experiment shall be carried out at the 1350-B hole of the BALAPAN testing area, with the following geographic coordinates:

49 degrees 52 minutes northern latitude
78 degrees 49 minutes eastern longitude.

The hole diameter, in terms of the drilling bit, shall be 920 millimeters, the depth from the entrance to the bottom of the hole (in terms of drilling) shall be 650 meters. The upper portion of the hole up to the depth of 60 meters shall be cased with a pipe having a diameter of 1020 millimeters, the remaining portion of the hole shall be uncased; the hole shall be filled with water from the level of 10 meters from the entrance and deeper. The nuclear device shall be emplaced at the depth of 645 meters.

2. In the vicinity of the emplacement hole the U.S. side shall drill a satellite hole with a diameter of 311 millimeters and a depth of not less than 675 meters in such a manner that in the zone of hydrodynamic measurements (plus 100 meters to minus 30 meters, counting from the center of the explosion) the satellite hole will be at a distance of 11 plus or minus 3 meters from the axis of the emplacement hole, and it will be as straight as possible.

3. In the hydrodynamic measurements zone of the emplacement hole from the 7 meter mark up to the 100 meter mark above the center of the explosion six CORRTEX sensor cables of the U.S. side shall be laid: 2 RF-214 cables, 1 RF-14 cable, 2 FSJ1-50 cables, and 1 HJ-4 cable. All cables shall begin at the plus 7 meter mark and shall go up to the plus 100 meter mark. At that upper mark the FSJ1-50 and HJ-4 cables shall be connected through a coupling to the RF-14 cable which shall go up to the entrance of the hole and further along the ground surface to the recording instrumentation. The RF-14 and RF-214 cables shall be continuous throughout the entire portion of the hole.

4. In the emplacement hole MIZ sensor cables (2 RK75-2-11 cables), contact switches on a logging cable (2-DRK contact switches), and contact switches on a RF cable (2 channels with RF cables) of the Soviet side shall be installed; the intervals of installing shall be as follows: for the MIZ sensor cables -- 5-50 meters, for the logging DRK contact switches -- 4-11.5 meters, for RF cable -- 6-27 meters.

5. Installation of sensors and sensor cables along the cross section of the emplacement hole (see Fig. 1), as well as methods for installing them and documenting their initial position have been specified in document No. 17, "Supplying and Installing Sensors and Cables in Preparation for the JVE."

6. In the satellite hole sensor cables and contact switches of both sides shall be installed on a fiberglass pipe within the following depth range, relative to the center of the explosion:

6.1 Sensors and sensor cables of the Soviet side:
Strings of contact switches (RKD contact switches)
No. 1 -- from minus 15 up to plus 15 meters,
No. 2 -- from minus 5 up to plus 25 meters,
No. 3 -- from plus 17 up to plus 47 meters;
MIZ sensor cables (RK75-2-11)
No. 1 -- from minus 15 up to plus 50 meters,
No. 2 -- from minus 5 up to plus 50 meters.

6.2 Sensor cables of the U.S. side:

The number, types and installation methods of these cables shall be the same as in the emplacement hole; however, the depth range in this case shall be different -- all six cables shall begin at the minus 30 meter mark relative to the center of the explosion.

7. Methods of attaching sensor cables and sensors, as well as their location in relation to each other on the fiberglass pipe (see Fig. 2) have been specified in document No. 17.

8. For the purposes of controlling the actual value of stemming density in the hydrodynamic measurement zone, and taking into account the novelty of the proposed technique and the composition of the stemming material for the satellite hole at the Semipalatinsk Test Site, gamma density probes of the Soviet side shall be installed in the emplacement and satellite holes at the following marks, counting from the location of the center of the explosion:

emplacement hole: minus 2 meters, plus 2 meters, plus 6 meters, plus 12 meters, plus 20 meters, plus 35 meters, plus 50 meters

satellite hole: minus 15 meters, plus 20 meters.

Nevada Test Site:

1. The Joint Verification Experiment shall be carried out in the U19AX hole, drilled at the Pahute Mesa testing area, with the following geographic coordinates:

37 degrees 18 minutes northern latitude,
116 degrees 18 minutes western longitude.

The hole diameter in terms of the drilling bit is 2.44 meters, and its depth from the entrance to the bottom of the hole (in terms of drilling) was 670.6 meters. At the last depth measurement, it was found to be 660.8 meters. The upper portion of the hole up to the depth of 18 meters shall be cased with a pipe having a diameter of 2.49 meters, and the remainder of the hole shall be uncased; the hole shall be dry. The nuclear device shall be emplaced at the depth of 615.7 meters.

2. In the vicinity of the emplacement hole the U.S. side shall drill a satellite hole with a diameter of 311 millimeters and a depth of no less than 655 meters in such a manner that in the zone of hydrodynamic measurements (plus 150 meters to minus 30 meters, counting from the center of the explosion) it will be at the distance of 11 plus or minus 3 meters from the axis of the emplacement hole, and it will be as straight as possible.

3. In the emplacement hole at distances from 7 up to 77 meters, counting from the center of the explosion, six measuring channels of the Soviet side shall be installed, namely:

2 MIZ sensor cables (the U.S. side shall provide the RF-214 sensor cables for this purpose) at the marks from plus 7 up to plus 77 meters;

2 channels of sensors on a logging cable, including 4 KG7-70-90 cables, at the marks from plus 7 up to plus 16 meters, and from plus 9 up to plus 18 meters;

2 channels of sensors on a RF cable at the marks from plus 12 up to plus 30 meters, and from plus 14 up to plus 40 meters.

4. In the emplacement hole, in the portion from 5 up to 150 meters above the center of the explosion, six CORRTEX sensor cables of the U.S. side shall be laid: 1 RF-214 cable, 1 RF-14 cable, 2 HJ-4 cables, and 2 FSJ1-50 cables. All cables shall begin at the 5 meter mark and shall go up to the 150 meter mark, where they shall be connected through a coupling to the U.S. gas-blocked RF-14 cable which shall be laid up to the recording instrumentation.

5. Installation of sensors and sensor cables along the cross section of the hole (see Fig. 3), as well as methods for installing them and documenting their initial position, has been specified in document No. 17.

6. In the satellite hole sensor cables and contact switches of both sides shall be installed on a fiberglass pipe within the following range of distances, counting from the location of the center of the explosion:

6.1 Sensors and sensor cables of the Soviet side:
strings of contact switches (RKD contact switches)

No. 1 -- from minus 15 up to plus 15 meters,

No. 2 -- from minus 5 up to plus 25 meters,

No. 3 -- from plus 17 up to plus 47 meters.

MIZ sensor cables (the RF-214 cables shall be provided by the U.S. side)

No. 1 -- from minus 15 up to plus 55 meters,

No. 2 -- from minus 5 up to plus 56 meters.

6.2 Sensor cables of the U.S. side:

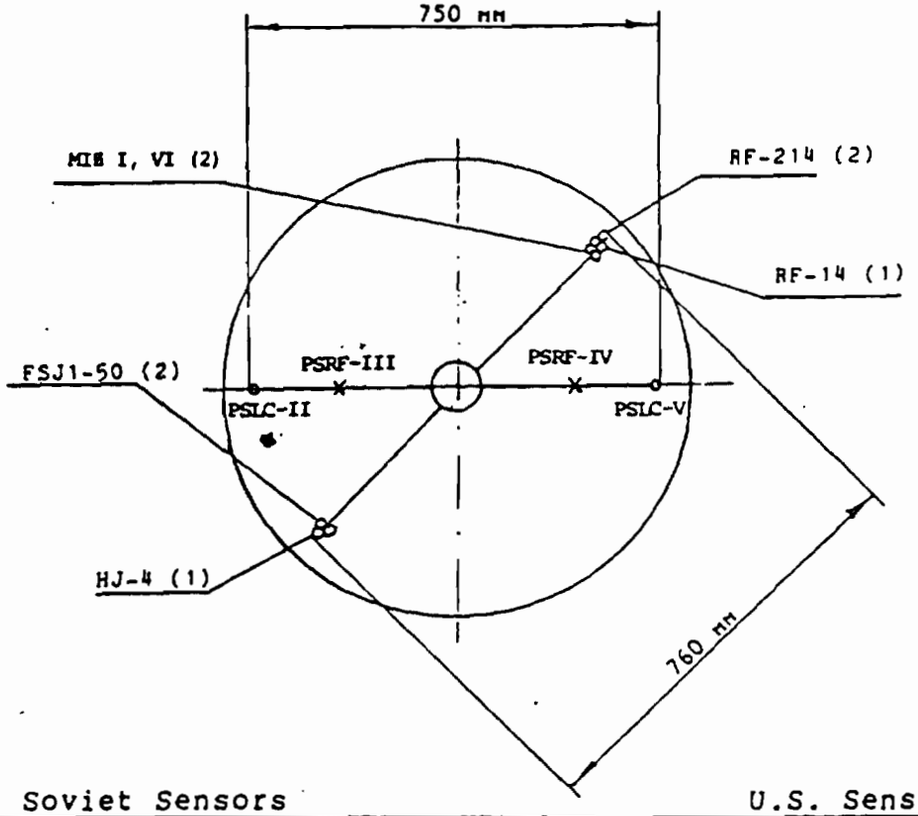
The number of these cables and their types, as well as the upper portion of the depth range and procedures for ensuring containment, shall be the same as in the emplacement hole; however, the lower portion of the depth range shall begin at the minus 30 meter mark relative to the center of the explosion.

7. The method of attaching sensor cables and sensors, as well as their location in relation to each other on the fiberglass pipe (see Fig. 4), have been specified in document No. 17.

8. For the purposes of controlling the actual value of stemming density in the hydrodynamic measurement zone, gamma density probes of the Soviet side shall be installed in the emplacement hole, in accordance with document No. 19, "Responsibility of the Sides in Locating Density Probes in the Emplacement Hole During the JVE at the Nevada Test Site."

9. In connection with the use of an almost traditional technique for stemming the satellite hole at the Nevada Test Site, gamma density probes shall not be installed there.

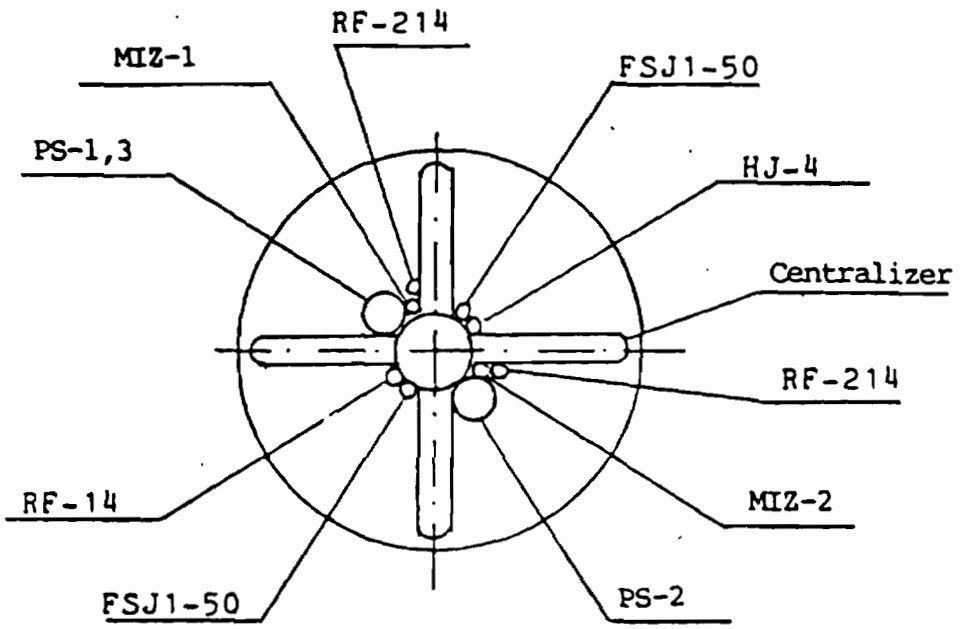
Figure 1. Location of Emplacement Hole Sensors
Semipalatinsk Test Site




| Soviet Sensors | Range* From | Range* To | U.S. Sensors | Range* From | Range* To |
|---|---|---|---|---|---|
| MIZ I, VI (2PK75-2-11) | 5 | 50 | FSJ1-50 (2) | 7 | 100 |
| PSLC-II (DPK-2) (14 Pins-Switch) | 4 | 11.5 | HJ-4 (1) | 7 | 100 |
| PSRF-III (PK-3) (24 pins) | 6 | 23 | RF-214 (2) | 7 | Trailer |
| PSRF-IV (PK-4) (24 pins) | 7 | 27 | RF-14 (1) | 7 | Trailer |
| PSLC-V (DPK-5) (14 Pins-Switch) | 4 | 11.5 | Cables FSJ1-50 & HJ-4 transition to RF-14 at + 100 meters | | |
| In-hole - Soviet Cables | | | | | |

*In meters, above the center of explosion

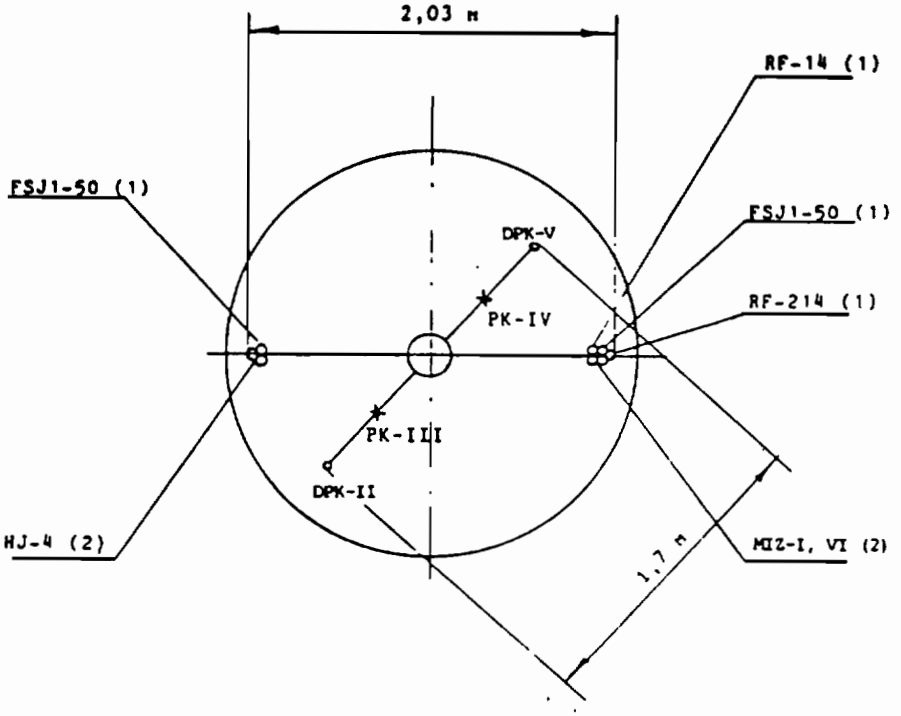
Figure 2. Location of Satellite Hole Sensors
Semipalatinsk Test Site




| Soviet Sensors | Range* From | Range* To | U.S. Sensors | Range* From | Range* To |
|---|---|---|---|---|---|
| MIZ-1 | -15 | +50 | FSJ1-50 (2) | -30 | +100 |
| MIZ-2 | - 5 | +50 | HJ-4 (1) | -30 | +100 |
| PS-1 (30 pins) (PKD-1) | -15 | +15 | RF-214 (2) | -30 | Trailer |
| PS-2 (30 pins) (PKD-2) | - 5 | +25 | RF-14 (1) | -30 | Trailer |
| PS-3 (30 pins) (PKD-3) | +17 | +47 | Cables FSJ1-50 & HJ-4 transition to RF-14 at + 100 meters | | |
| In-hole Soviet Cables | | | | | |

*In meters, relative to the center of explosion

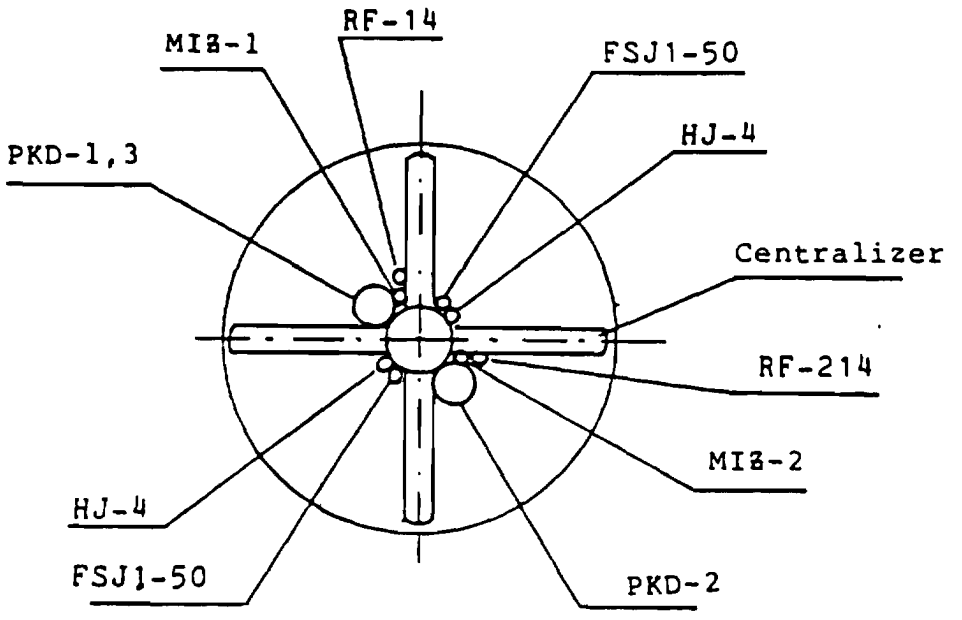
Figure 3. Location of Emplacement Hole Sensors Nevada Test Site




| Soviet Sensors | Range* From | Range* To | U.S. Sensors | Range* From | Range* To |
|---|---|---|---|---|---|
| MIZ-I, VI, 2 RF-214 | + 7 | +77 | FSJ1-50 (2) | + 5 | +150 |
| DPK-II (PSLC-II) (14 Pins-Switches) | + 7 | +16 | HJ-4 (2) | + 5 | +150 |
| PK-III (PSRF-III) (24 Pins-Switches) | +12 | +32 | RF-14 (1) | + 5 | +150 |
| PK-IV (PSRF-IV) (24 Pins-Switches) | +14 | +40 | RF-214 (1) | + 5 | +150 |
| DPK-V (PSLC-V) (14 Pins-Switches) | + 9 | +18 | | | |
| At + 77 meters, MIZ and PSRF cables transition to RF-14, and PSLC cables transition to MP-44 | | | At + 150 meters all cables except the RF-14 transition to RF-14 | | |

*In meters, relative to the center of explosion

Figure 4. Location of Satellite Hole Sensors
Nevada Test Site




| Soviet Sensors | | | U.S. Sensors | | |
|---|---|---|---|---|---|
| | Range* | | | Range* | |
| | From | To | | From | To |
| MIZ-1, 2 (2 RF-214) | -15<br>- 5 | +55<br>+56 | FSJ1-50 (2) | -30 | +150 |
| PKD-1 (PS-1) (30 pins) | -15 | +15 | HJ-4 (2) | -30 | +150 |
| PKD-2 (PS-2) (30 pins) | - 5 | +25 | RF-214 (1) | -30 | Trailer |
| PKD-3 (PS-3) (30 pins) | +17 | +47 | RF-14 (1) | -30 | Trailer |

*In meters, relative to the center of explosion

## 11. CORE SAMPLING PROCEDURE

### I. General Requirements

1. Core samples must have the following typical sizes:
-- diameter of approximately 60 millimeters
-- length 100 - 1000 millimeters.

2. The extracted core must be geologically described and sealed.

2.1 Geological description must cover the entire depth range from which the core was extracted, and be described in a written document which is shipped to the verifying side together with core samples.

2.2 During packaging, core samples should be kept in the same sequence in which they were extracted from the core barrel.

2.3 The core samples are coated with paraffin and sealed in plastic bags.

3. The extracted and packaged cores should have the following clear labelling:
-- Hole (emplacement or satellite hole, one label on each packing container);
-- Depth (in meters from the collar of each hole at the upper end of each core sample, stated to the nearest centimeter). Core samples from the side walls of the emplacement hole at the Nevada Test Site shall show the depth of coring, the number of the coring hole for each coring depth, the sequential number of each whole core sample fragment, and the distance in centimeters from the side wall to the nearest end of the core sample;
-- Directions (marked by an arrow directed away from the ground surface for Semipalatinsk Test Site holes and for the satellite hole at the Nevada Test Site; with regard to the cores from the emplacement hole at the Nevada Test Site, the direction of the arrow should be from the wall of the hole towards the rock);

Notes:

1. Labeling should be made with permanent ink or any other means guaranteeing its preservation.

2. Depth should be indicated based on the actual location of the core in the geological formation.

4. The distribution of cores between the sides must be carried out on an equal basis so that each side can have samples representing all layers of the rock present in the hydrodynamic measurement zone.

5. From a part of the selected cores intended for the verifying side, the latter selects the cores to be sent for further testing. The quantity of the cores to be sent will depend on the complexity of the geological structure and shall be determined by the designated personnel of the verifying side on the test site of the testing side.

## II. Locations and Quantity of Cores

### At the Nevada Test Site

1. Emplacement Hole

Cores are sampled in the presence of the Soviet designated personnel by drilling core holes in the sidewalls of the emplacement hole in the depth range starting at 50 meters above the planned nuclear device emplacement point and extending down to 15 meters below the planned nuclear device emplacement point or to the bottom of the hole, whichever is encountered first. One sample will be taken from each point with an average increment of 2.5 meters (no more than 27 points over the entire depth); the total length of the core beyond the zone of sidewall damage is from 250 - 1000 millimeters (specified by designated personnel of the Soviet side by means of a visual inspection during coring). The azimuth of the coring hole is not specified.

2. Satellite Hole

Cores are taken by the U.S. side in the presence of the Soviet designated personnel during the drilling of the hole in the depth range beginning 70 meters above the planned nuclear device emplacement point and extending down to 30 meters below the planned nuclear device emplacement point, with the exception of those areas where directional drilling is required.

### At the Semipalatinsk Test Site

1. Emplacement Hole.

Continuous cores are taken by the Soviet side without the presence of the designated personnel of the U.S. side in the depth range of 600 - 650 meters, taking into account the actual percentage of the output and specific requirements of the U.S. side, in accordance with document No. 12, "Procedure for Coring and Transferring Cores from the Hydrodynamic Zone of the Emplacement Hole at the Semipalatinsk Test Site, designated for the JVE."

2. Satellite Hole.

Cores are taken by U.S. designated personnel in the presence of Soviet personnel during the drilling of the hole at the depth range of 580-680 meters, with the exception of those areas where directional drilling is required.

## 12. PROCEDURE FOR CORING AND TRANSFERRING CORES FROM THE HYDRODYNAMIC ZONE OF THE EMPLACEMENT HOLE AT THE SEMIPALATINSK TEST SITE DESIGNATED FOR THE JVE

1. Coring is carried out by the Soviet side without the presence of U.S. designated personnel.
2. Coring is carried out at the interval of depths from 600 to 650 meters, which is the bottom of the hole.
3. Dimensions of core samples:
   Diameter -- 60 - 80 millimeters;
   Length -- 100 - 1000 millimeters.
4. Coring of the hole is continuous.

5. Core samples are equitably distributed between the sides: core samples from each even meter of the length of the recovered core are transferred to the U.S. side; core samples from each odd meter of that length are transferred to the Soviet side. The U.S. side also receives half of the fragmented core material from each 10 meters of the recovered core, which is separately packed and marked, with an indication of the upper and lower depths of coring.

6. The core brought to the surface is geologically described, hermetically packed, and marked.

7. The geological description is provided for the entire depth of coring, and is stated in the text of the document which is transferred to the U.S. side together with the transmitted core.

8. Cores are coated with paraffin and sealed in plastic bags.

9. The marking of the core samples includes the following:
   - the designation of the hole (one marking on each packing box);
   - depth of coring (in meters measured from the hole collar at the upper end of each core sample);
   - direction of coring (an arrow pointing downward).

10. The marking is done in any manner that guarantees its integrity during transporting.

11. The recovered core material is packed into wooden boxes with the gross weight not greater than 60 kilograms each.

12. The packed core is transmitted through the USSR Ministry of Foreign Affairs to the representatives of the U.S. Embassy in Moscow.

## 13. RESPONSIBILITIES OF THE U.S. AND THE USSR SIDES WITH REGARD TO CORING OF THE EMPLACEMENT AND SATELLITE HOLES AND DRILLING OF THE SATELLITE HOLE AT THE NEVADA TEST SITE

### U.S. Responsibilities

1. Select and build a drilling site near the top of the satellite hole.

2. Drill the satellite hole with the final diameter of 311 millimeters to a depth not less than 30 meters below the planned nuclear device emplacement point at a distance of 11 plus or minus 3 meters from the emplacement hole in the hydrodynamic measurement zone. Install surface casing to the depth required.

3. Conduct gyroscopic surveying of the emplacement and satellite holes. Ensure maximally precise geometric referencing of the axes of the emplacement and satellite holes in the hydrodynamic measurement zone.

4. Log the emplacement and satellite holes in the hydrodynamic zone in accordance with the list of operations agreed upon with the Soviet side.

5. Core the satellite hole over a range of 100 meters, from a depth of 70 meters above the planned nuclear device emplacement point to a depth of 30 meters below the planned nuclear device emplacement point.

6. Accomplish sidewall coring of the emplacement hole over the range of depths from 50 meters above the planned nuclear device emplacement point to 15 meters below the planned nuclear device emplacement point or the bottom of the hole, whichever is encountered first, in accordance with the mutually agreed upon requirements with regard to the number, size, location (depth) of core samples, as well as the technique for labelling, preserving, and packaging of core samples.

7. Ensure the delivery of core samples from the Nevada Test Site to the permanent Mission of the USSR to the United Nations in New York.

USSR Responsibilities

1. Monitor coring of the satellite and emplacement holes.

2. Participate in the distribution of core samples between both sides on an equal basis for the satellite hole, and on a mutually agreed upon basis for the emplacement hole.

3. Determine the number of core samples to be shipped to the USSR.

4. Organize delivery of core samples from New York to the USSR.

5. Monitor geometric referencing of the satellite and emplacement holes. Concur in the document laying out the results of geometric referencing of the holes.

6. Monitor logging of the emplacement and satellite holes.

## 14. U.S. AND USSR RESPONSIBILITIES IN DRILLING THE SATELLITE HOLE AT THE SEMIPALATINSK TEST SITE

U.S. Responsibilities

1. Survey the emplacement hole with the gyroscopic survey tool to total depth.

2. Specify the location (distance and azimuth from the emplacement hole) of the satellite hole.

3. Drill 17 3/4 inch diameter hole (45.1 centimeters) to about 165 feet (50 meters). Install surface casing.

4. Jointly with USSR designated personnel, log the emplacement hole--the suite of logs to be jointly decided to satisfy the technical requirements of both sides. Complete this logging before the hydrodynamic zone of the satellite hole is drilled and cored.

5. Drill the satellite hole with diameter of 12 1/4 inches (311 millimeters) to about 680 meter depth at a distance of 11 plus or minus 3 meters from the emplacement hole in the hydrodynamic measurement zone.

6. Take core samples during the drilling of the satellite hole on a pattern to be mutually agreed in the region from about 580 to 680 meters.

7. Log the satellite hole -- the suite of logs to be decided to satisfy the technical requirements of both sides.

8. Survey both the emplacement hole and the satellite hole with the gyroscopic survey tool.

USSR Responsibilities

1. Build the drill location to accommodate the satellite hole drilling (distance and azimuth of the satellite hole to be specified by the U.S. side).
2. Install conductor for 17 3/4 inch drill bit (45.1 centimeter drill bit) through the unstable surface layers, in the form of a tube with inside diameter of 18-20 inches (45.7 - 50.8 centimeters), and cement it in place.
3. Inform the U.S. side of the depth of the surface casing in the emplacement hole, the reasons for the choice of its depth, and any drilling difficulties involved in drilling the hole for its installation.
4. Cement-in the surface casing in the satellite hole under direction from the U.S. designated personnel.
5. Furnish equipment and operators to assemble the drill rig under supervision of U.S. designated personnel.
6. Furnish water, appropriate diesel fuel, gasoline and storage to the drill site.
7. Furnish machine shop support as needed to attempt rapid repair of broken parts.
8. Arrange to accommodate the returns (fluid, cuttings) during the satellite hole drilling.
9. Jointly with U.S. designated personnel, log the emplacement hole--the suite of logs to be jointly decided to satisfy the technical requirements of both sides. Complete this logging before the hydrodynamic measurement zone of the satellite hole is drilled and cored.

## 15. LOGGING OPERATIONS IN THE EMPLACEMENT AND SATELLITE HOLES IN PREPARATION FOR THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

1. The set of logging operations includes the following: caliper logs, directional survey, thermometry, electrical logging, density survey, acoustic and nuclear logging. Each side shall pay special attention to directional surveys carried out for the purpose of determining the geometric referencing of the emplacement and satellite holes in the hydrodynamic measurements zones.

To estimate more accurately the distance between the axes of the emplacement and satellite holes (if there is a discrepancy in measurements of distance between the holes based on the directional survey), by mutual agreement of the sides additional geophysical methods may be used.

The testing side may, at its discretion, carry out any additional logs that it desires in the emplacement hole and/or satellite hole.

2. The set of logging operations and laboratory operations should provide the following data:
-- geological and geophysical information related to the holes, from their tops to their bottoms;
-- physical and mechanical properties of the surrounding rock (such as maximum compressibility strength, tension strength, shear strength, angle of internal friction, deformation modulus, transverse deformation ratio, transverse and longitudinal wave velocity, electrical resistance, volume density, grain density, porosity, moisture content);
-- technical condition of the holes' structure and of their side-walls;
-- spatial position of the holes and their geometric referencing in the hydrodynamic measurements zone.

3. Each side may further specify the set of equipment for logging operations by agreement with the other side, depending on specific field conditions at the test site of the testing side.

4. The preliminary results of the set of logging operations are to be exchanged in the form of texts and tables after the studies are completed and their results are processed and documented at the test site of the testing side, before the nuclear device and hydrodynamic measurements equipment are emplaced.

The final exchange of information on the set of logging operations shall be carried out before the experiment.

5. Logging procedures at the test sites.

5.1. Semipalatinsk test site.

5.1.1. Emplacement hole.

The sides jointly conduct the set of logging operations throughout the entire depth of the hole, including directional survey for the purpose of subsequent measurement of distance between the emplacement and satellite holes, with each side using its own equipment or, by mutual agreement, the equipment of one of the sides.

5.1.2. Satellite hole.

Directional survey in the process of drilling shall be carried out by the U.S. side using its equipment in the presence of Soviet personnel.

After the hole is drilled to its planned depth, each side shall carry out geophysical logging and directional survey in the hole, using its own equipment or, by mutual agreement, the equipment of one of the sides.

5.1.3. The sides shall jointly determine the geometrical referencing of the emplacement and satellite holes, based on the results of directional survey in the emplacement and satellite holes.

5.2. Nevada test site.

5.2.1. Emplacement hole.

The U.S. side shall carry out logging operations through the entire depth of the hole, including the hydrodynamic measurements zone, in the presence of Soviet designated personnel. To estimate more accurately the spatial positioning of the hole for the purpose of subsequent measurement of distance between the emplacement and satellite holes, each side shall carry out directional survey using its own equipment or, by mutual agreement, the equipment of one of the sides.

5.2.2. Satellite hole.

Directional survey in the process of drilling shall be carried out by the U.S. side using its own equipment, in the presence of Soviet designated personnel.

After the hole is drilled to its planned depth, each side shall carry out geophysical logging and directional survey in the hole, using its own equipment or, by mutual agreement, the equipment of one of the sides.

5.2.3. The sides shall jointly determine the geometric referencing of the emplacement and satellite holes, based on the results of directional survey in the emplacement and satellite holes.

## 16. RESPONSIBILITIES FOR THE PREPARATION OF HYDRODYNAMIC MEASUREMENTS IN THE JVE SATELLITE HOLES

At the Nevada Test Site

1. The U.S. side shall be responsible for:

1.1 Provision and utilization of emplacement equipment throughout the entire period of operations on the satellite hole.

1.2 Provision of about 700 meters of fiberglass pipe 3.51 inches in diameter (89.15 millimeters) and a special bull nose for the emplacement column.

1.3 Provision and preparation of its own sensor cables, MIZ sensor cables, means for measuring stemming density, devices for measuring the elongation of the fiberglass pipe column, directional surveying equipment, and all other cables lowered into the satellite hole.

1.4 Installation of all sensor cables and other devices, jointly with the Soviet designated personnel, onto the fiberglass emplacement pipe prior to and/or during its emplacement into the satellite hole, in accordance with documents No. 10 and 17.

1.5 Conduct, with participation of the Soviet designated personnel:

-- directional surveying of the emplacement pipe column with sensors after it is lowered into the satellite hole;
-- measurements of the actual elongation of the fiberglass pipe column.

2. The Soviet side shall be responsible for:

2.1 Provision and preparation of pin switch strings and devices for their mounting to the fiberglass pipe.

2.2 Installation of pin switch strings on the emplacement pipe column, as well as joint installation with the U.S. personnel of MIZ sensor cables, in accordance with documents No. 10, "Configuration of Hydrodynamic Measurements in the Emplacement and Satellite Holes at the Nevada Test Site and Semipalatinsk Test Site during the Conduct of the JVE," and 17, "Supplying and Installing Sensors and Cables in Preparation for the JVE."

2.3 Participation with the U.S. personnel during:
-- directional surveying of the emplacement pipe column with the sensors after it is lowered into the satellite hole;
-- measurements of the actual elongation of the fiberglass emplacement pipe column.

At the Semipalatinsk Test Site

1. The Soviet side shall be responsible for:

1.1 Provision and utilization of emplacement equipment throughout the entire period of operations on the satellite hole.

1.2 Provision and preparation of emplaced sensors, sensor cables, density probes and connecting cables for its own hydrodynamic and support measurements.

1.3 Joint installation with the U.S. designated personnel of sensors, sensor cables, and other emplaced devices on the fiberglass emplacement pipe before and/or during its emplacement into the satellite hole, in accordance with document No. 10, and document No. 17.

1.4 Emplacement of the fiberglass pipe column with sensors and cables to the planned depth.

1.5 Participation with and support of the U.S. designated personnel during:
-- directional surveying of the emplacement pipe column with sensors after it is lowered into the satellite hole;
-- measurements of the actual elongation of the fiberglass emplacement pipe column.

2. The U.S. Side shall be responsible for:

2.1 Provision of about 700 meters of fiberglass pipe 3.51 inches in diameter (89.15 millimeters), and a steel bull nose for the emplacement column.

2.2 Provision and preparation of its own emplaced sensor cables, devices for monitoring stemming integrity, devices for measuring the elongation of the fiberglass pipe column, directional surveying equipment, and all other U.S. cables lowered into the satellite hole.

2.3 Joint installation with the Soviet personnel of sensor cables and other emplaced devices on the fiberglass emplacement pipe before and/or during its emplacement into the satellite hole, in accordance with documents No. 10 and 17.

2.4 Conduct, with participation and support of Soviet personnel:
-- directional surveying of the emplacement pipe column with sensors after it is lowered into the satellite hole;
-- measurements of the actual elongation of the fiberglass pipe column.

## 17. SUPPLYING AND INSTALLING SENSORS AND CABLES IN PREPARATION FOR THE JVE

### I. Supplying Cables

For the JVE experiment at the Nevada Test Site, the USSR will bring its own cables, connected to density probes and contactor switches. These cables will extend through the hydrodynamic measurement zone in both the emplacement hole and the satellite hole, up to a point 77 meters above the explosion point. The U.S. will provide cables to connect to the USSR cables at their end points. The U.S. cables will extend up to the tops of the holes and across the ground surface to the USSR recording facility.

For the JVE experiment at the Semipalatinsk Test Site, the U.S. will bring all its own cables, which will extend from the hydrodynamic measurement zone in both the emplacement hole and the satellite hole up to the tops of the holes and across the ground surface to the U.S. recording facility.

If cables of different impedance must be connected, or if cable and instrument input impedances do not match, devices for matching those impedances will be supplied and serviced by the designated personnel of the verifying side.

### II. The Method of Laying Cables on the Surface

The testing side, using its personnel and its techniques, will lay out the cables for the verifying side, ensuring the integrity of them and protecting their quality for the entire period from the moment of laying out until the test is conducted. If necessary, the testing side will assist in repair of damaged cables. Each side should bring with it spare cables of its own unique type, since these could not be replaced by the testing side. The verifying side has the right to inspect the cables associated with its measurements at any time, and to keep them under constant surveillance.

### III. Support of Sensors and Cables in the Emplacement Hole

For the Nevada Test Site:

- the CORRTEX and MIZ sensing cables will be attached together to typical support brackets of the U.S. side;
- Soviet side's contactor switches will be attached to support brackets provided by the U.S. side.

For the Semipalatinsk Test Site:
-- contactor switches of the Soviet side will be attached to Soviet-provided support brackets
-- CORRTEX sensing cables will be attached to U.S.-provided support brackets with the following characteristics:
- maximum dimension across the hole -- 760 millimeters;
- the external diameter of the emplacement pipe on which the support brackets will be installed -- 89 millimeters plus/minus 0.9 millimeters
- the vertical plane in which the support brackets will be installed is at 60 degrees to the vertical plane in which the Soviet support brackets with contactor switches will be installed;
- the Soviet side's MIZ sensing cables will be attached together with the CORRTEX sensing cables;
- the U.S. support brackets will accommodate the CORRTEX cables as well as the MIZ cables.

## IV. Support of Sensors and Sensing Cables in the Satellite Hole

At both test sites the method of support will be the same, and it is as follows:

- the lowering of the system of all sensors will be carried out on a fiberglass pipe with the diameter of 3.51 inches (at both test sites the pipe is provided by the U.S. side)

- the six CORRTEX sensing cables and the two MIZ sensing cables will be attached to the pipe in accordance with the usual technique of the U.S. side, using equipment provided by the U.S.

- three strings of contactor switches of the Soviet side will be attached to the emplacing pipe by mechanical clamps in such a way that the lower string will be located in the depth range of minus 15 to plus 15 meters from the center of the explosion's energy release, the middle string in the depth range of minus 5 to plus 25 meters, and the upper string in the depth range of plus 17 to plus 47 meters.

The clamps will be provided by the Soviet side.

## V. Attaching Cables in the Emplacement and Satellite Holes

### Emplacement Hole

Cables coming from the device canister and other cables (density probes, gamma detectors, etc.) in the hydrodynamic measurement zone may be attached to lateral brackets whose vertical plane of location is different from the vertical plane of installation of sensors and sensing cables for hydrodynamic measurements, or they may be attached to the emplacement pipe, in which case they will be tightly packed against that pipe's external surface. The combination of these two methods of installing cables is possible. Above the hydrodynamic

measurement zone all cables will be attached to the emplacement pipe in accordance with the technique of the testing side. The specialists from both sides will participate in installing and attaching of cables in the hydrodynamic measurement zone. The installation of protective or other necessary devices along the entire length of cables during the lowering process will be carried out by the testing side's personnel in accordance with their normal practice.

Satellite Hole.

Cables will be attached to the emplacement pipe with the help of metal and rubber clamps, and they will be wrapped in protective material (insulation tape, fabric, etc.) in accordance with the technique and by the specialist of the testing side, with observation by designated personnel of the verifying side.

## VI. Measuring Sensors' Location

Emplacement Hole

The testing side will indicate the reference mark for measuring distances along the vertical emplacement pipe in the form of a horizontal line on the external surface of that pipe .5 millimeters wide and 50 millimeters long. This line will continue around the pipe as a bright color painted band 1 centimeter wide. The reference mark should be approximately 7 meters above the center of the device canister, and its position relative to the center of the device canister should be known and given to the verifying side with an accuracy not worse than plus/minus 5 millimeters.

For measuring the locations of sensors, loops on sensing cables, and marks on sensing cables, both sides will use a metal measuring tape and take photographs (to be provided by the testing side), as well as documentation in working logs. No fewer than four people will participate in these measurements.

The measurements will be carried out both while the assembled section of the emplacement string is in the horizontal position (should this be possible), and directly during the process of lowering the entire column into the emplacement hole.

Satellite Hole

The line where the steel tip joins the lower end of the first (lowest) section of fiberglass tube will be used as the reference marker for measuring distances along the emplacement pipe.

Measurements shall be carried out by the testing side and the verifying side, using a metal measuring tape and photography (to be provided by the testing side), as well as documentation in the working logs of the groups from both sides.

The length of the entire emplacement column will be measured by measuring the length of each pipe section between marks near each end prior to emplacement. During emplacement, the distances between the marks on adjacent pipes will be

measured after each two adjacent portions of the pipe are screwed together during the process of lowering. The overall length of the column will be corrected for its stretch after the emplacement, in accordance with data provided by the U.S. side. The overall length of the column will be measured from the upper plane of the mouth of the satellite hole, the vertical position of which in relation to the mouth of the emplacement hole will be known and reported to the verifying side with an accuracy of no less than plus/minus 5 millimeters.

In any event, the verifying side should be provided with information enabling it to convert unequivocally the values of the length of the emplacement string and the positions of the sensors (measured by the technique described above) into the distances from the effective center of the explosion to the sensors and the sensing cables in the satellite hole with the greatest accuracy possible.

### VII. Combining Parallel Measurements

CORRTEX and MIZ sensing cables will be installed in the same bundle. In the region up to 50 meters above the center of the device canister at the Semipalatinsk Test Site and up to 77 meters at the Nevada Test Site the measurement of distances will be carried out jointly by both sides. The CORRTEX sensor cables will extend up to 100 meters above the center of the device canister at the Semipalatinsk Test Site and to 150 meters at the Nevada Test Site. In the range from plus 50 meters to plus 100 meters at the Semipalatinsk Test Site and from plus 77 meters to plus 150 meters at the Nevada Test Site, the U.S. side will be responsible for the measurement of distances.

The MIZ loops will be installed within the range of distances at which Soviet contactor switches are installed.

Documenting records of the measured distances to the sensors of both sides will be taken by both sides, and compared immediately. The lowering operation will not proceed until both sides agree on the measurement of these distances.

## 18. COMMAND AND MONITOR SIGNALS FOR THE JVE

At both the Nevada Test Site and the Semipalatinsk Test Site, the Command System of the testing side will be used to send command signals to the hydrodynamic recording instrumentation of the verifying side at times specified by the verifying side. The testing side will also arrange that monitor signals, indicating the receipt of the command signals by the verifying side's instrumentation, are transmitted back to the control point and displayed to designated personnel of the verifying side's team in real time during the conduct of dry runs and of the actual test. At both test sites, the command signals will be synchronized with a mutually accepted worldwide time standard.

The following information is specific to the individual test sites.

At the Nevada Test Site

The Soviet side requires command signals transmitted to its hydrodynamic recording instrumentation at the following times:

1. minus 15 minutes
2. minus 10 minutes
3. minus 40 seconds
4. minus 1 second

The command signals at minus 15 minutes and minus 10 minutes will be sent manually, with a deviation from the desired time not greater than plus or minus 15 seconds. The command signal at minus 40 seconds and at minus 1 second will be sent automatically, with an uncertainty of plus or minus 100 milliseconds. Each command signal will impose a potential of 24 volts plus or minus 2.4 volts across a dedicated pair of conductors which link the U.S. timing station with the Soviet hydrodynamic recording instrumentation. The link between the U.S. timing station and the Soviet instrumentation will be made redundant by providing a second pair of conductors for each command, to be closed by a second pair of relay contacts. The maximum current to be drawn in these circuits is 100 milliamps. The U.S. side control point will be linked with the Soviet instrumentation and control point for the purpose of providing command and monitor signals through cables and microwave links supplied by the U.S. side.

At the U.S. control point, Soviet designated personnel will have access to a U.S.-provided visual display which will indicate the proper receipt of each of the command signals at the Soviet instrumentation. A permanent record of the time of transmission of each signal will also be made. Since these command signals are transmitted redundantly over two conductor pairs, the proper receipt of each of these dual signals will be separately indicated in the display at the U.S. control point. The Soviet designated personnel at the U.S. control point will also monitor three power supply voltages and receipt of each of a pair of identical fiducial signals. All of this monitor information will be transmitted from the Soviet instrumentation and the trailer park in accordance with techniques described during the Soviet visit to the Nevada Test Site ("Overview Briefing for the Control Room and Forward Area"). Monitor signals supplied by the Soviets' instrumentation will be in the form of closures of dry relay contacts.

The U.S. side will also transmit to the Soviet hydrodynamic recording instrumentation a fiducial signal at 5-20 microseconds before the time of the nuclear explosion. The U.S. side will inform the Soviet side of the time interval between the mid-point of the rise of this signal and the nuclear explosion with an accuracy of plus or minus 1 microsecond. The fiducial signal will consist of a pulse of positive-polarity voltage of 40 to 120 volts in amplitude, (into a 50 ohm terminator), with a rise time of less than 0.3 microsecond, and with a time duration of about 1 microsecond at half amplitude. This signal will be sent over a pair of redundant coaxial cables, which will be provided by the U.S. side.

The U.S. will plan to hold the command signals 1, 3, and 4 to the Soviet instrumentation until plus 1 minute, and to hold command signal 2 until plus 15 minutes.

At the Semipalatinsk Test Site

The U.S. side requires command signals transmitted to its hydrodynamic recording instrumentation at the following times:

1. minus 15 minutes
2. minus 2 minutes
3. minus 1 minute

The minus 15 minute command and the minus 2 minute command will be sent manually, and a deviation of plus or minus 15 seconds about the desired time is acceptable. The minus 1 minute signal will be sent automatically with an accuracy better than plus or minus 2 seconds. Each command signal will impose a potential of 24 volts plus or minus 2.4 volts upon a dedicated pair of conductors, which link the Soviet command point and the U.S. side's instrumentation and control center. The maximum current to be drawn in these circuits is 100 milliamperes. At the Soviet control point U.S. designated personnel will have access to a Soviet-provided visual display which will indicate the proper receipt of each of the command signals and will make a permanent record of the time of transmission of each signal. The Soviet side command point will be linked with the U.S. instrumentation and control point for the purpose of providing command and monitor signals through cables supplied and laid by the Soviet side. The U.S. designated personnel will also monitor and control the proper functioning of its hydrodynamic recording instrumentation by means of a monitoring and control system which the U.S. designated personnel will bring to the Soviet control point, and which will be linked to the hydrodynamic recording instrumentation by means of cables which the U.S. side will provide.

The Soviet side will also transmit to the U.S. hydrodynamic recording instrumentation a fiducial signal at 5-20 microseconds before the time of the nuclear explosion. The Soviet side will inform the U.S. side of the time interval between the mid-point of the rise of this signal and the nuclear explosion with an accuracy of plus or minus 0.5 microsecond. The fiducial signal will consist of a pulse of positive-polarity voltage of 40 to 120 volts in amplitude (into 75 ohm impedence), with a rise time of less than 0.3 microsecond, and a time duration of about 1 microsecond at half amplitude. It will be transmitted on two coaxial cables supplied by the Soviet side.

## 19. RESPONSIBILITY OF THE SIDES IN LOCATING DENSITY PROBES IN THE EMPLACEMENT HOLE DURING THE JVE AT THE NEVADA TEST SITE

1. USSR gamma density probes shall be located at the following distances from the center of explosion: minus 2.5 meters, plus 5 meters, plus 8 meters, plus 10 meters, plus 20 meters, plus 35 meters, plus 50 meters. When specific circumstances related to the presence of couplings, centralizers, support brackets of other sensors, etc., during emplacement require it, deviations from such distances of up to plus or minus 0.5 meters are permissible. Gamma density probes shall be attached to the emplacement pipe with support brackets; the distance from the emplacement pipe axis to the density probe axis may amount to 150 - 300 millimeters.

2. The Soviet side shall provide:
- gamma density probes: 7 plus 3 spares;
- Co-60 radioactive sources: 7 plus 3 spares;
- support brackets for attaching the density probes: 7 plus 3 spares;
- cables leading from each density probe to the adapter-connector per each logging cable: 7;
- adapter-connectors per each logging cable: 2;
- logging cables: 2;
- adapter-connectors of the KG7-70-90 logging cable to the U.S. MP-44 multiconductor cable: 2;
- adapter-signal splitter for the multiconductor cable connecting it to several coaxial cables: 2 (above ground);
- 1 density recording instrumentation set for SG 112A1 (IP system).

3. The U.S. side shall provide:
- MP-44 multiconductor cables from a depth of plus 77 meters to the top of the hole (2) and RF-14 coaxial cables above ground (2) in accordance with document No. 17, "Supplying and Installing Sensors and Cables in Preparation for the JVE";
- For the density probe beneath the device canister, a communication line consisting of either a two-conductor cable with insulated copper conductors of cross-sectional area no smaller than that of the main conductors in MP-44 cable, capable of withstanding a 600 volt working potential (direct current); or a length of RF-14 cable.
- Device for attaching the density probe under the canister at the selected location.

4. The Soviet side shall be responsible for:
- calibrating and operating the density probes and the density measuring recording system.
- installing density probes, and installing density

probe cables and adapters supplied by the Soviet side.

5. The U.S. side shall be responsible for:

- the installation of its multiconductor cables down hole as well as the laying of its coaxial cables along the ground surface as specified in document No. 17;
- ensuring the integrity of the line to the bottom density probe, throughout the entire density measurement period.

6. Both sides shall be equally responsible for quality control of U.S. and USSR cable connections at points where they are joined to each other.

7. The U.S. side shall provide technical support to the designated Soviet personnel during the gamma density probe calibration, carried out with equipment provided by the U.S. side, for purposes of meeting USSR technical requirements for measurements carried out by the Soviet side during the JVE at the Nevada Test Site.

8. Stemming medium density measurements shall be made at each density probe installation point until stable values have been established. In each case and no later than 24 hours prior to the explosion the cables from the density probes leading out of the hole shall be disconnected from the cables leading to the SG 112A1. Thereafter the entire surface cable line of the density measuring system may be dismantled.

## 20. STEMMING OF THE EMPLACEMENT AND SATELLITE HOLES DURING THE CONDUCT OF THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

Nevada Test Site:

Emplacement Hole

1. The stemming of the hole in the hydrodynamic measurement zone shall be carried out by the U.S. side:

- from the bottom of the hole to the minus 9 meter mark--with the dry pourable material normally used at the Nevada Test Site;
- in the depth range from minus 9 meter to plus 9 meter marks--using dry pourable material with uniform density of 2.3 grams per cubic centimeter plus or minus 10 percent;
- in the depth range from plus 9 meters to plus 70 meters -- using the grout with a density of ((2.3 grams per cubic centimeter)) plus or minus 10 percent.

The density of stemming shall be measured by Soviet designated personnel using gamma density probes, and shall be monitored by the U.S. side using their standard techniques.

The Soviet designated personnel shall measure the density in accordance with document No. 19, "Responsibility of the Sides in Locating Density Probes in the Emplacement Hole During the JVE at the Nevada Test Site."

2. The stemming of the hole above the plus 70 meter mark shall be carried out in accordance with the technique used at the test site. Care shall be taken to avoid damage to cables during stemming.

3. The Soviet designated personnel shall be provided an opportunity to carry out continuous and unimpeded observation of the stemming process.

4. Samples of each material used for the stemming of the hydrodynamic zone and taken directly during the process of stemming shall be provided to the Soviet designated personnel in sealed containers.

5. Temperature monitoring of the cement segments of the stemming shall be carried out by the U.S. personnel and Soviet designated personnel based on the data from temperature sensors installed by the U.S. personnel on the emplacement pipe column in the areas where cement segments are located.

Satellite Hole

1. The stemming of the hole in the depth interval from the bottom to the plus 150 meter mark above the center of the explosion shall be carried out by the U.S. side using cement grout with a density of ((2.3 grams per cubic centimeter)) plus or minus 10 percent.

The density of stemming shall be monitored by the U.S. personnel using standard NTS techniques, in the presence of the Soviet designated personnel.

2. The stemming of the hole above the plus 150 meter mark shall be carried out by the U.S. personnel in accordance with the technique used at the test site. Care shall be taken to avoid damage to cables during stemming.

3. The Soviet designated personnel shall be provided an opportunity to carry out continuous and unimpeded observation of the stemming process.

4. Samples of the cement grout used for the stemming of the hydrodynamic zone of the hole in the amounts necessary for determining bulk weight and strength of the solidified grout shall be taken in no less than three locations along the stemming depth during the process of pumping the grout into the hole. Samples of the grout that have solidified in conditions close to natural shall be sealed and distributed between the sides in equal quantities.

The results of laboratory studies of samples shall be recorded in a joint document.

Semipalatinsk Test Site

Emplacement Hole:

1. The stemming of the hole from its bottom to the plus 100 meter mark above the center of the explosion shall be carried out by the Soviet side using a sediment of iron ore concentrate in water, with a density of 3 grams per cubic centimeter plus or minus 10 percent. The density of stemming

shall be measured by the Soviet gamma density probes in the presence of the U.S. designated personnel.

2. The stemming of the hole above the plus 100 meter mark shall be carried out by the Soviet side's personnel in accordance with the technology used at the test site. Care shall be taken to avoid damage to cables during stemming.

3. The U.S. designated personnel shall be provided an opportunity to carry out continuous and unobstructed observation of the stemming process.

4. Samples of iron ore concentrate, used for stemming of the hydrodynamic zone and taken directly during the process of stemming, shall be provided to the U.S. designated personnel.

5. Temperature monitoring of the cement segments of the stemming shall be carried out by the Soviet personnel and U.S. designated personnel based on the data from temperature sensors installed by the Soviet personnel on the emplacment pipe column in the areas where cement segments are located.

Satellite Hole:

1. It is planned that the stemming of the hole in the depth interval from the bottom to the plus 100 meter mark above the center of the explosion will be carried out using heavy cement grout with a density of 2.7 grams per cubic centimeter plus or minus 10 percent; the composition of this grout and the technique for pumping it into the hole using standard grouting equipment shall be developed by the U.S. side.
The density of stemming shall be monitored by gamma density probes of the Soviet side in the presence of the U.S. designated personnel.

2. Responsibilities of the sides concerning provision of components of the heavy cement grout, provision of grouting equipment and conduct of stemming operations shall be specified in a separate mutually agreed document, depending on the results of developing heavy cement grout and on the possibility of pumping it into the hole using standard Soviet grouting equipment.

3. The stemming of the hole above the plus 100 meter mark shall be carried out by the Soviet personnel in accordance with the techniques commonly employed at the test site, which must be compatible with the technique for the stemming of the hydrodynamic zone. The process of correlating such techniques shall be carried out with the participation of both sides, based on the results of refining the technique for obtaining and using the heavy cement grout. Care shall be taken to avoid damage to cables during stemming.

4. The U.S. designated personnel shall be provided an opportunity to carry out continuous and unimpeded observation of the stemming process.

5. Samples of heavy cement grout in quantities necessary for determining bulk weight and strength of the solidified grout shall be taken in no less than three points along the stemming depth during the process of pumping the grout into the hole.

Samples of heavy cement grout, which have solidified in conditions close to natural, shall be sealed and distributed between the sides in equal quantities.

The results of laboratory studies of samples shall be recorded in a joint document.

## 21. TRAILER PARK EQUIPMENT FOR THE CONDUCT OF JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

Nevada Test Site

1. Location, shock mitigation devices

The U.S. trailer park shall be located 312 meters from the top of the holes.

The Soviet trailer containing hydrodynamic measuring instruments and diesel power stations which supply power to it shall be located approximately 510 meters from the top of the hole and approximately 680 meters from the U.S. trailer park during the preparation and conduct of measurements.

Mutual location of the sides' trailers is shown in Figures 3 and 4.

The U.S. side shall provide shock mitigation devices for the Soviet trailer removed from its chassis and for the diesel power stations, which shall reduce the effect of overloads after the explosion so as not to exceed 4 g. The U.S. side shall measure the acceleration values both on the surface, at the location of the Soviet trailer, and on the body of the Soviet trailer.

2. Power Supply

At the Nevada Test Site, the instrumentation complex SG112A1 shall be powered by two diesel power stations (one is a spare) provided and serviced by the U.S. side. The diesel power stations shall supply 3-phase 3 x 380/220 volts, 50 Hertz to the instrumentation complex. Voltage oscillations should not exceed plus or minus 10 percent, frequency oscillations, plus or minus 1 percent, with regard to nominal values, with 0-20 kilowatt power consumption (maximum power consumption required for the Soviet trailer). Voltage should be supplied during the entire period of preparation and conduct of the experiment, up to plus 2 hours after the explosion.

If a computer, included in the SG112A1 complex, is used for processing the results of hydrodynamic measurements, the U.S. side shall provide for a possibility of retaining the Soviet instrumentation complex in the CP-41 facility for 10 days after the explosion and for providing power supply from diesel power stations.

If power stations are more than 50 meters away from the instrumentation complex SG112A1, the U.S. side shall install 4-conductor copper power cable (cross-section no less than: three 50 square millimeter plus one 16 square millimeter conductors) with operating voltage of no less than 500 volts between the power stations and the complex, and shall connect this power cable to the power stations. If the distance between the power stations and the instrumentation complex SG112A1 shall not exceed 50 meters, then the power cable included in the SG112A1 set shall be used to connect the instrumentation complex to the power stations.

Semipalatinsk Test Site:

1. Location, shock mitigation devices.

The Soviet trailer park will be located at a distance of 2 kilometers from the top of the holes; no special shock mitigation devices will be needed since at this distance accelerations for near threshold yield will not exceed 4g.

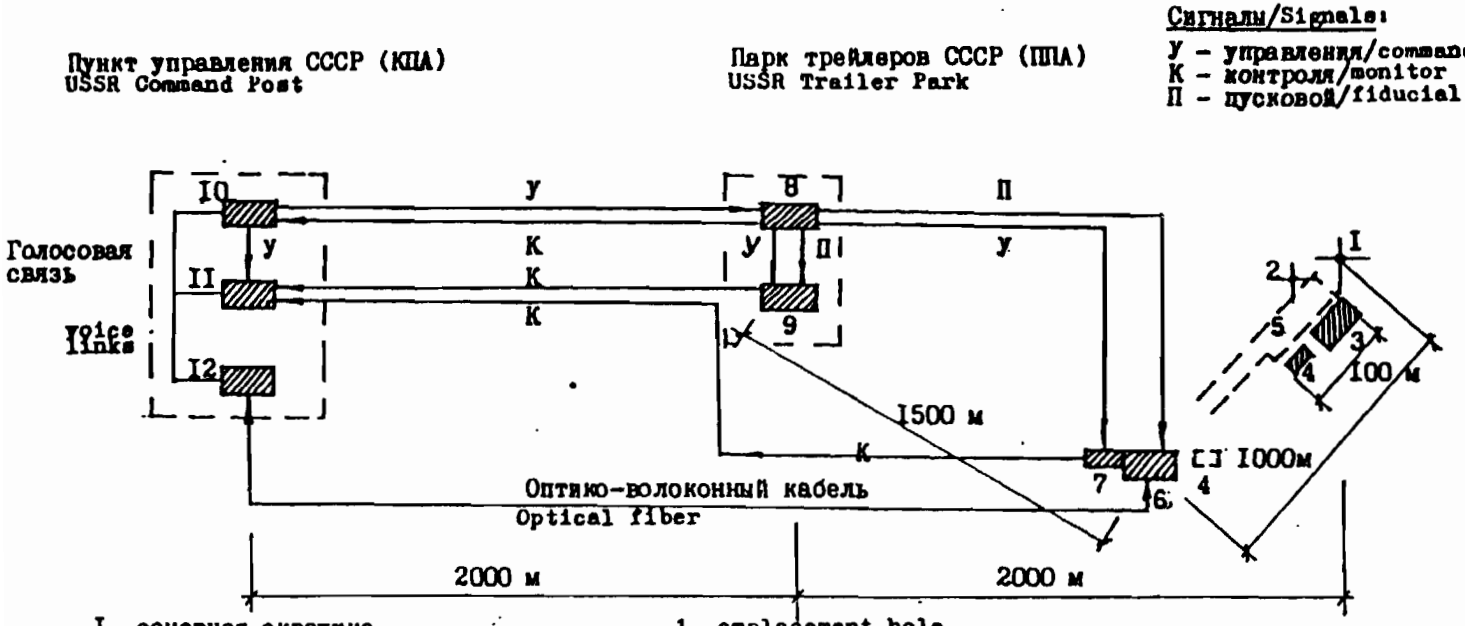
CORRTEX instrumentation of the U.S. side will be located in the U.S. Recording Station. It will be provided by the U.S. side, and will be installed approximately 1 kilometer from the top of the holes and about 1.5 kilometers from the Soviet recording trailer park. The U.S. side shall assume responsibility for providing a shock mitigation platform and material to protect the U.S. Recording Station from ground shock. The Soviet side will assist the U.S. in assembly and installation of the platform and material.

The U.S. Monitor and Control Facility, which functions as a processing center, will be located in the vicinity of the Soviet control point, about 4 kilometers from the top of the holes. The trailer or building to house this facility will be provided by the Soviet side. The Soviet side will also provide a trailer to be set-up as a joint Soviet-U.S. monitoring facility. The locations of these facilities are shown in Figures 1 and 2.

2. Power supply.

The U.S. Recording Station (at 1 kilometer from the emplacement hole) will be supplied with three-phase 380/220 volt (plus or minus 10 percent), 50 plus or minus 0.5 Hertz electrical power at 50 kilovolt-amperes. The U.S. Monitor and Control Facility (at or near the Soviet Control Point) will be supplied with three-phase 380/220 volt (plus or minus 10 percent), 50 plus or minus 0.5 Hertz electrical power at 10 kilovolt-amperes. During the preparatory operations, this power will be supplied from an industrial network, while for dry runs and for the actual test, power will be supplied by Soviet diesel power stations with the same voltage and frequency characteristics.

The temporary U.S. instrument shack near the satellite hole will be supplied by the Soviet side with single-phase 220 volt (plus or minus 10 percent), 50 plus or minus 0.5 Hertz electrical power at 5 kilovolt-amperes. At each of the three locations, the U.S. side will supply a frequency convertor to provide 60 Hertz power to its equipment.




| | |
|---|---|
| I. основная скважина | 1. emplacement hole |
| 2. вспомогательная скважина | 2. satellite hole |
| 3. временное приборное сооружение | 3. temporary instrumentation shack |
| 4. вагон-домик | 4. mobile working station |
| 5. площадка для подготовки кабелей | 5. cable preparation area |
| 6. регистрирующая станция США | 6. US recording station |
| 7. прибор СБА-21 СССР | 7. USSR SBA-21 |
| 8. трейлер автоматики СССР | 8. USSR automation trailer |
| 9. трейлер гидродинамических измерений | 9. USSR hydrodynamic measurements trailer |
| I0. командный трейлер СССР | 10. USSR command trailer |
| II. трейлер контроля СССР и США | 11. USSR/US monitor trailer |
| I2. контрольно-наблюдательный объект США | 12. US monitor and control facility |

Рис.I. Схема размещения трейлеров и связей между ними на Семипалатинском испытательном полигоне
Fig.1. Trailer Locations and Connecting Lines between them at the Semipalatinsk Test Site

Fig.2 U.S.Cableway at STS

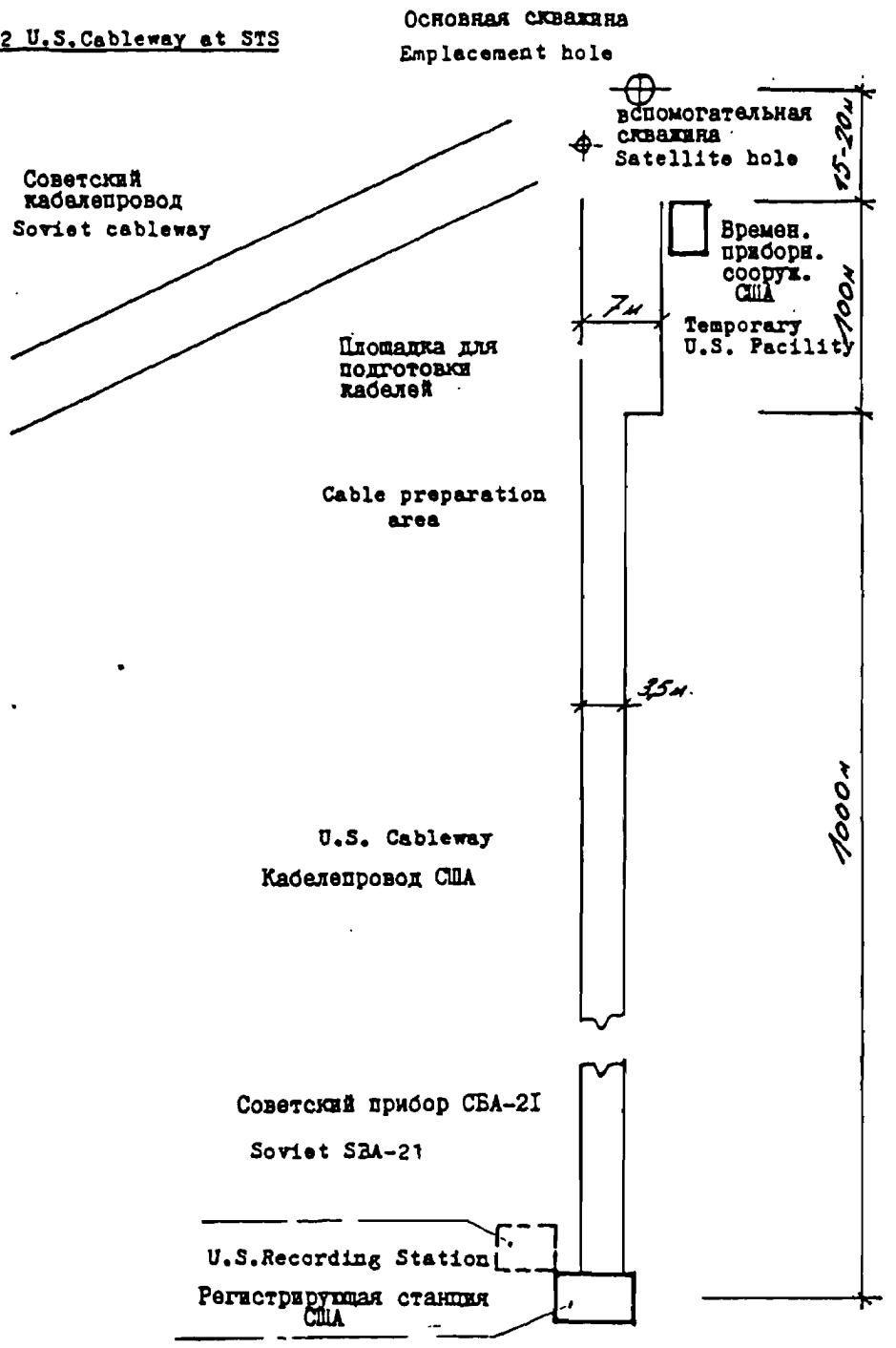
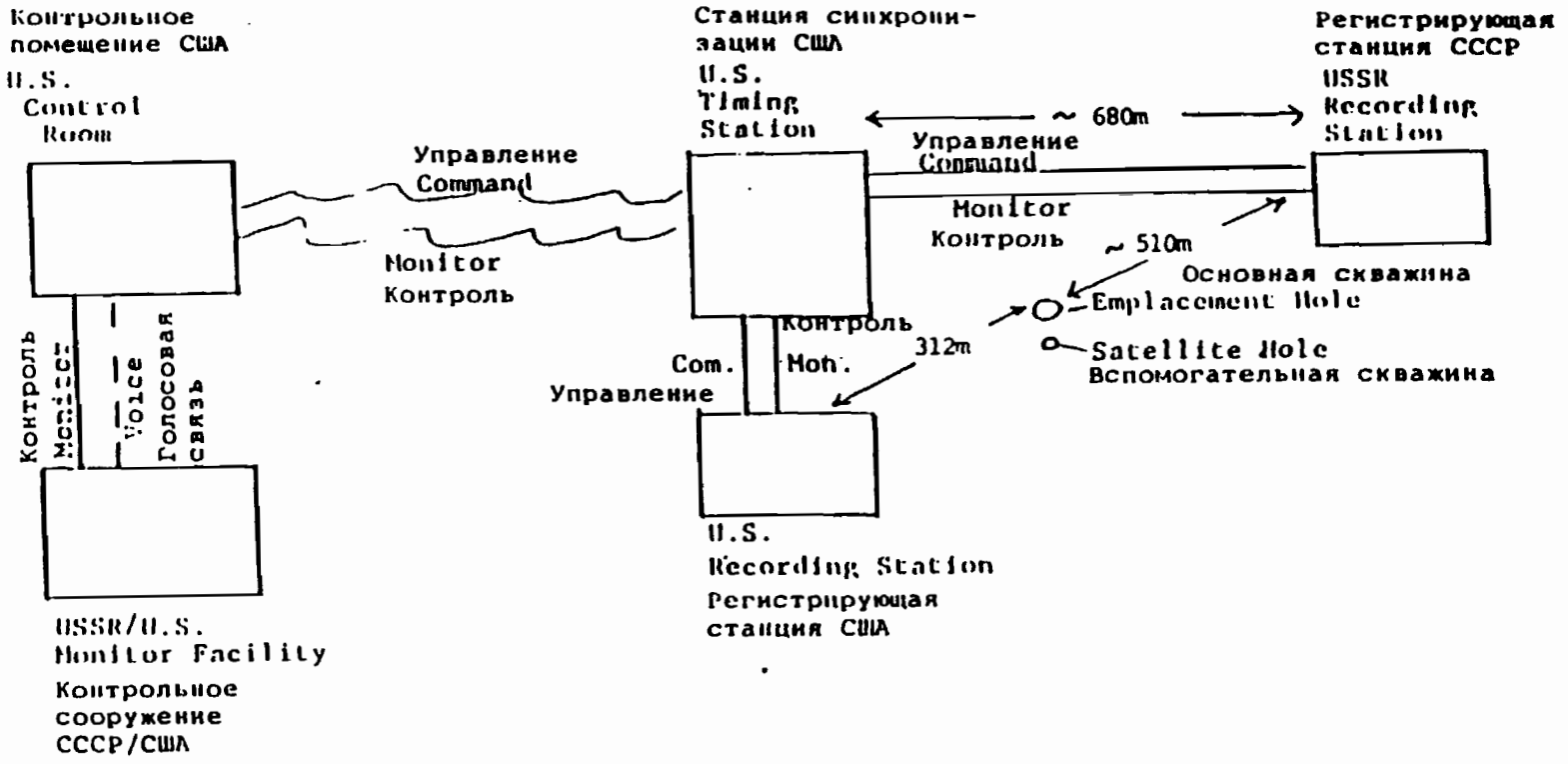
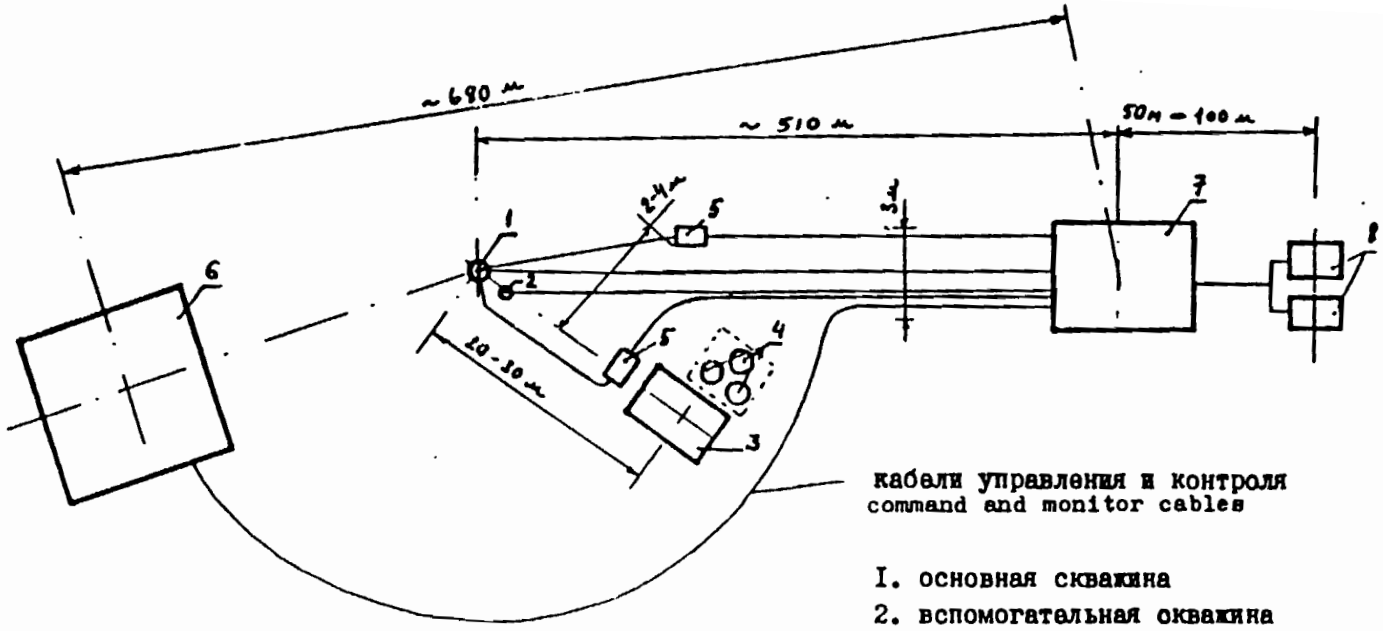



Рис. 2. Кабелепровод американской стороны на Семипалатинском испытательном полигоне

Рис. 3 РАСПОЛОЖЕНИЕ СООРУЖЕНИЙ СЭК НА НИП

Fig.3 JVE FACILITY CONFIGURATION AT NTS






1. emplacement hole
2. satellite hole
3. instrumentation shack
4. density probe calibration tanks
5. cable boxes
6. U.S.trailer park
7. Soviet SG112A1 trailer
8. diesel power stations

I. основная скважина
2. вспомогательная скважина
3. приборное сооружение
4. калибровочные емкости для плотномеров
5. кабельные ящики
6. парк трейлеров США
7. советский трейлер СТИ2АИ
8. дизельные электростанции

Рис. 4. Схема размещения трейлеров и связей между ними на Невадском испытательном полигоне

Fig. 4. Trailer Locations and Connecting Lines between them at the Nevada Test Site

## 22. PROCEDURE FOR EXCHANGING DATA DURING THE PREPARATION, CONDUCT AND PROCESSING OF THE RESULTS OF THE JVE

1. Prior to and/or during the lowering of sensors and/or sensor cables into the emplacement and satellite holes, the sides shall exchange the results of measurements of distances between sensors and/or sensor cables and the established uniform benchmarks on emplacing pipes.

2. Not later than 20 days prior to the planned date for conducting the JVE explosion at each test site, the sides shall exchange available data on properties of the rock from the hydrodynamic measurement zones in the emplacement and satellite holes at the given test site under normal conditions and under formation conditions (particle density, bulk density, porosity, moisture content, chemical composition, available data on strength, velocity of longitudinal and shear waves), as well as information on shock compressibility for no less than 5 pressure values between 500 kilobars (kbar) and 2 Megabars (Mbar), and no less than 5 values between 50 kbar and 500 kbar. Preliminary values for relevant material taken from other than the final satellite hole core samples will be provided if final values based on the satellite hole core samples are not available, but these preliminary values will be supplemented if necessary with final values from the JVE satellite hole core sample materials. During the exchange of data on shock compressibility each side, when possible, shall provide the other side with more detailed information on the rock of its JVE site, including information going beyond the specified ranges of pressure.

3. The sides shall exchange data concerning the results of studies of shock wave processes in any region where phase transformations occur in specific rocks in the JVE hydrodynamic measurement zone.

4. Not later than 20 days prior to the planned date of the JVE explosion at each test site, the sides shall exchange the results of preliminary shock compressibility studies of stemming materials for the emplacement and satellite holes, conducted for 3 values in each pressure range: 50-500 kbar and 500-1000 kbar. Such studies are of a lower priority as compared to the studies of rock properties pursuant to paragraph 2 of this document. In studying specific materials, 3 consecutive priority levels shall be identified: Nevada Test Site gypsum cement and Semipalatinsk Test Site iron ore concentrate water mixture for materials used for stemming emplacement holes, cement mixtures of the composition used for satellite hole stemming at each test site, and garnet sand for stemming the Nevada Test Site emplacement hole.

5. Not later than 20 days prior to the planned date of the JVE explosion at each test site, the sides shall exchange initial equations-of-state data, provided in tabular form, for rock formations in the hydrodynamic measurement zones in the

emplacement and satellite JVE holes at the given test site. For each type of material tables must contain values of energy and pressure of the material as a function of temperature and density, or values of pressure as a function of density and internal energy must be provided. The range of such variables must be sufficient to permit conducting, for each JVE explosion, the hydrodynamic calculations required pursuant to paragraph 6 of this document. The sides shall also provide to each other their preferred forms of the equation-of-state used in the calculations mentioned above.

6. Not later than ten days prior to the planned date for conducting the JVE explosion at each test site, the sides shall exchange the results of hydrodynamic calculations based on equations-of-state derived from the shock wave measurements made and reported in accordance with paragraph 2 of this document as well as other material properties listed in that paragraph. These results will be exchanged by the sides in the form of shock radius vs. time curves scaled to 1 kt, showing calculation points in tabular form and with sufficient density so that linear interpolation introduces no significant error in the yield determination. If preliminary equations-of-state are used, final calculations of the same kind will be exchanged when the final shock compressibility data for the satellite hole core samples are available.

7. Not later than five days after the lowering of sensors into the satellite hole, the sides shall exchange data on the geometric referencing of sensors and/or sensor cables to the center point of the device canister.

8. Not later than two days prior to the planned date for conducting the JVE explosion at each test site, each side shall present a procedure or procedures for processing the results of the forthcoming JVE measurements to obtain values of JVE explosion yield from each side's radius vs. time data, taking into account the specific data including error estimates with regard to distances between sensors and the center of the explosion, and with regard to values of the stemming medium density in each hole. These procedures will include a procedure based on simulated explosion scaling using the calculated radius vs. time curves which are subject to exchange in accordance with paragraph 6 of this document.

9. Recovery of all data of the visiting side, as well as recovery of all JVE related data of the host side, preparation of duplicate recordings for each hydrodynamic measurement recording channel in the JVE, and exchange of identical copies of each recording by lot shall be carried out in the presence of authorized representatives of both sides at the test site of the host side as soon as possible after the explosion is conducted. The exchange of duplicate recordings shall be carried out at the time of recovery or, if this is not possible, not later than one day after the carriers of the obtained data are recovered.

10. Not later than three days after data recovery and exchange, the sides shall exchange preliminary radius vs. time diagrams or lists showing every radius vs. time point for each measurement channel. If significant differences exist among the radius vs. time curves, the sides shall confer promptly in an effort to explain and resolve these differences. The significance of differences shall be determined on the basis of standard statistical procedures, taking into account both random and systematic errors.

11. Not later than ten days after each JVE explosion is conducted, each side will report to the other side its yield estimates for the JVE explosions, based on the procedure or procedures specified in paragraph 8 of this document, together with uncertainty values.

12. All of the exchange procedures specified in paragraphs 1, 2, 4, 5, 6, 7, 8, 9, 10 and 11 of this document, and related to a specific explosion, shall be carried out directly at the test site of the side where the given explosion is conducted. With respect to certain kinds of data exchange, in individual cases the sides may agree upon another location for carrying out the relevant procedure.

13. Not later than 30 days after the second JVE explosion is conducted, the sides, in a reciprocal manner, shall provide the final results of yield estimates obtained by each side for each explosion based on measurements both in the emplacement and in the satellite holes. Within a specified time, the experts of both sides shall discuss the obtained results at a place selected by the Heads of Delegation.

## 23. PROGRAM FOR STUDYING THE EFFECTIVENESS OF ANTI-INTRUSIVENESS MEASURES IN CONDUCTING THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

The U.S. side and the Soviet side have agreed to the following steps to study the effectiveness of anti-intrusiveness measures during the JVE at the Nevada Test Site and the Semipalatinsk Test Site:

1. Each Side shall measure at its test site the levels of signals on cables and/or transmitted by electromagnetic radiation that might carry sensitive information not required for hydrodynamic verification and assess the effectiveness of measures carried out to reduce such signals. The results of these measurements shall be exchanged after the JVE.

2. The host side may provide and insert an anti-intrusiveness device into one of the satellite hole signal cables of the visiting side. The host side will measure the signal characteristics before and after the location of the device in the signal path to study the effectiveness of the device in preventing the transmission of sensitive data and to

demonstrate its non-interference with the signals required for yield measurement. The results of these measurements shall be exchanged after the JVE. At the Semipalatinsk Test Site, the anti-intrusive device shall be installed in the RF-214 cable; at the Nevada Test Site, it shall be installed in the cable running from String 1 of RKD pin switches.

3. Each Side will provide complete design and operational information on the anti-intrusiveness devices it proposes to use during the JVE. The Sides will exchange and consider views on desirable and undesirable characteristics of such devices and will provide a prototype device for experimentation by the other side.

4. If there is any sensitive information transmitted through the anti-intrusiveness device, the host side will remove that information prior to discussing the results. Such removal procedure will not alter the basic information needed for yield measurement. If such a process is used, it shall be described to the other side.

## 24. ANTI-INTRUSIVENESS MEASURES FOR THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

For the JVE, the Sides have agreed to the following anti-intrusiveness measures to protect against the collection of sensitive information.

1. If the visiting side proposes equipment for use in the JVE which the host side believes is capable of recording sensitive information, the visiting side must satisfy the host's concern by demonstrating that such equipment will not record sensitive information during the JVE explosion.

2. If the visiting side proposes equipment for use in preparing the JVE that is not required for actual measurement of the JVE explosion, such equipment shall be removed from the recording facility prior to the explosion if the host side believes this equipment is otherwise capable of recording sensitive information. Removal of such equipment shall be performed under observation of the host side and will be completed before the final dry run of the JVE explosion. The equipment will be held by the host side and will be returned to the visiting side at the time of return of the remainder of the equipment to the visiting side.

3. One week before delivery of its instrumentation and other equipment to the point of entry of the host side the visiting side shall provide a complete inventory, including spare parts, and block diagrams for each channel of signal recording systems. Each unit of recording equipment, including spares, will be identified by serial number. The visiting side will provide, no later than 10 days prior to the schedule date for the JVE explosion, revised block diagrams showing any substitutions that have been made and identifying equipment to be removed prior to the final dry run. On the day of the final

dry run, the visiting side will provide a list of any changes that have been made in the recording system shown in these revised block diagrams.

4. The U.S. will operate its CORRTEX units at the Semipalatinsk Test Site in a forward recording trailer. The data from the CORRTEX units will be transmitted by fiber optics to a command/control/storage facility. Data recovery, duplication, and exchange will take place in the command/control/storage facility in the presence of host personnel.

5. The Soviet side's recording trailer at the Nevada Test Site shall be located approximately 510 meters from the emplacement hole and approximately 680 meters from the U.S. trailer park. If Soviet designated personnel wish to re-enter the forward recording trailer, they will do so only under direct observation by U.S. personnel.

6. The U.S. recording trailer at the Semipalatinsk Test Site shall be located approximately 1000 meters from the emplacement hole and 1500 meters from the Soviet trailer park. If U.S. designated personnel wish to re-enter the forward CORRTEX trailer, they will do so only under direct observation by Soviet personnel. The location of the trailer containing U.S. data control, monitoring and storage equipment shall be determined by document No. 21, "Trailer Park Equipment for the Conduct of JVE at the Nevada Test Site and Semipalatinsk Test Site."

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## 25. CERTAIN ACTIVITIES OF PERSONNEL INCLUDING PROVISION FOR CONTINGENCIES DURING THE PREPARATION AND CONDUCT OF THE JVE AT THE NEVADA TEST SITE AND SEMIPALATINSK TEST SITE

1. Activities of the personnel of the visiting side during the preparation and conduct of the JVE at each test site shall be determined by paragraph 1 of document No. 32, "Miscellaneous Issues Related to the Preparation and Conduct of the JVE," and shall be coordinated with the activities of the host side through its senior representative at the test site.

2. The sides have agreed upon the following list of the most important operations to be carried out at the sides' test sites during conduct of the JVE, and in which the personnel of the visiting side are interested and/or shall participate:

- coring and logging operations;
- preparation of the equipment and the working area in the vicinity of the hole, and of an area for locating the visiting side's trailers;
- post-delivery inspection, assembly, and preparation of sensors (sensor cables), cables and equipment;
- emplacement of the device canister, sensors (sensor cables) and cables into the emplacement hole;
- post-delivery inspection, assembly, calibration, and emplacement of density probes into the emplacement hole at the Nevada Test Site;
- emplacement of sensors (sensor cables) into the satellite hole;
- stemming of the emplacement and satellite holes;
- all dry runs to check whether the instrumentation is ready for conducting the JVE;
- preparation of the command signal program, countdown and conduct of the explosion (including possible delays due to weather conditions and/or to failures of the recording instrumentation);
- joint pre- and post-explosion operations to be conducted in the testing area;
- duplication and exchange of the JVE hydrodynamic measurement data recordings;
- exchange of preliminary hydrodynamic measurement results and of JVE explosion yield estimates;

NOTE:
In order for the Soviet designated personnel to carry out preliminary processing of JVE explosion hydrodynamic measurement results at the Nevada Test Site, the U.S. side shall arrange to provide one or more IBM AT-80286 personal computers for use by designated personnel (at their request), with all costs to be borne by the Soviet side. IBM-compatible software shall be provided by the Soviet designated personnel.

3. To conduct each operation specified in paragaraph 2 of this document the senior representative of the host side at the test site and the visiting personnel team leader shall designate responsible individuals with authority and responsibility for the activities of their respective side's personnel during those operations.

If the designated responsible individual of the host side deems it necessary to postpone, interrupt, or stop any JVE operation, in so doing he shall observe safety rules, and shall immediately inform the designated responsible individual of the visiting side for that operation of this fact.

If the designated responsible individual of the visiting side deems it necessary to postpone, interrupt, or stop any operation being carried out jointly by the two sides, this shall be done immediately at his request by the designated responsible individual of the host side for that operation, while observing safety rules.

Problems that cannot be resolved by the designated responsible individuals shall be decided upon by the senior representative of the host side at the test site and the visiting personnel team leader, pursuant to the provisions of document No. 34, "Procedure for Resolving Questions Arising at the Test Sites during the Preparation and Conduct of the JVE."

4. Pursuant to paragraph 1 of document No. 32, the host side shall bear full responsibility for ensuring safe working conditions for JVE participants.

With regard to issues related to safety and radiation safety, JVE participants shall follow document No. 26, "Rules of Conduct for JVE at the Host's Test Site," and document No. 31, "Health Protection and Safety of the JVE Participants."

With regard to autonomous JVE operations by personnel of the visiting side, the activities of such personnel carrying out those operations shall be determined by the visiting side. In this case the responsibility for the health and safety of these personnel shall be borne exclusively by the visiting side.

With regard to joint operations involving a potential radiological danger (e.g., recovery of data after the JVE explosion) a decision to commence such operations shall be made jointly by the senior representative of the host side at the test site and the visiting personnel team leader on the basis of radiological surveillance results.

5. In any emergency situation that creates or may create a danger for the JVE participants of either side, the host side independently or jointly with the visiting personnel shall do everything possible to prevent or eliminate such a danger.

## 26. RULES OF CONDUCT FOR THE JVE AT THE HOST'S TEST SITE

1. Visiting personnel will be issued special photo badges that are to be individually worn and visibly displayed at all times such personnel are on the Host Test Site. The attached

diagrams specify those areas of the Host Test Sites in which Visitor personnel shall have freedom of movement without Host escort during the JVE. Host escort and permission shall be required for Visitor personnel access to other areas of the Host Test Site at all times.

2. Transportation of all Visitor personnel and equipment within the Host Test Site will be furnished by the Host. An agreed upon schedule of activities along with a daily routine will be followed with appropriate transportation provided by the Host to carry out JVE work.

3. The Host's customary safety and health physics procedures will be followed during JVE activities at the Host Test Site. The Host will provide personnel familiar with Test Site safety requirements to familiarize and assist Visitor personnel in compliance with such procedures.

4. Use or possession by Visitor personnel of the following items is prohibited at the Host Test Site:

- firearms and ammunition
- narcotics (unless prescribed by a physician)
- photographic and video recording equipment
- radio transmitters
- tape recorders
- optical devices for observation.

5. The following items may not be removed by Visitor personnel from the Host Test Site:

- soil
- vegetation
- water samples
- animals
- rocks, metal objects or debris.

6. The Visitor's team leader shall at all times be allowed to communicate promptly with his embassy in the Host Country and with his home government departments.

7. The Host shall immediately notify the Visitor's team leader of any questions, violations, or incidents that involve Visitor personnel, including any detention or denial of access.

Figure 1. Diagram of Mercury, Nevada

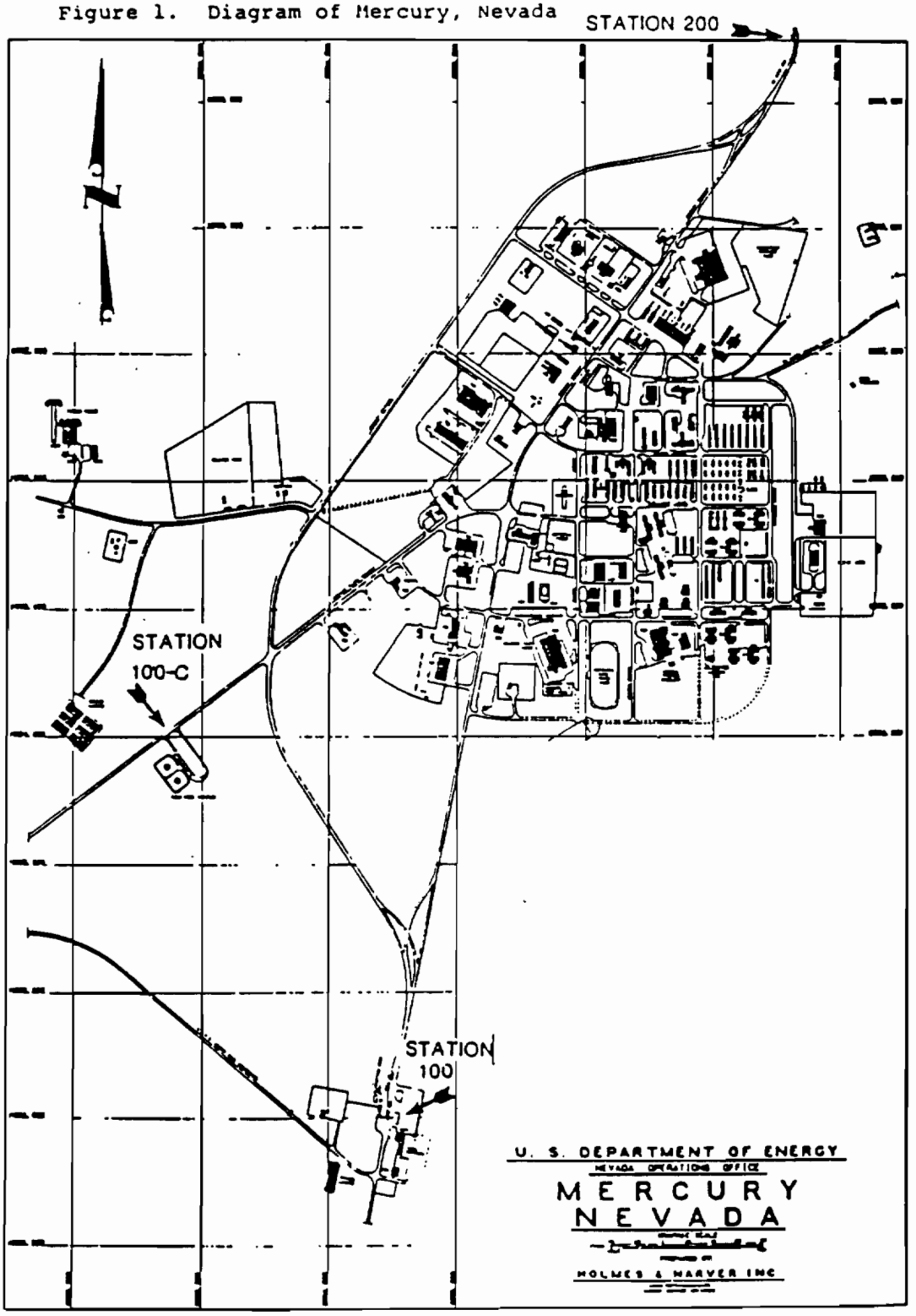
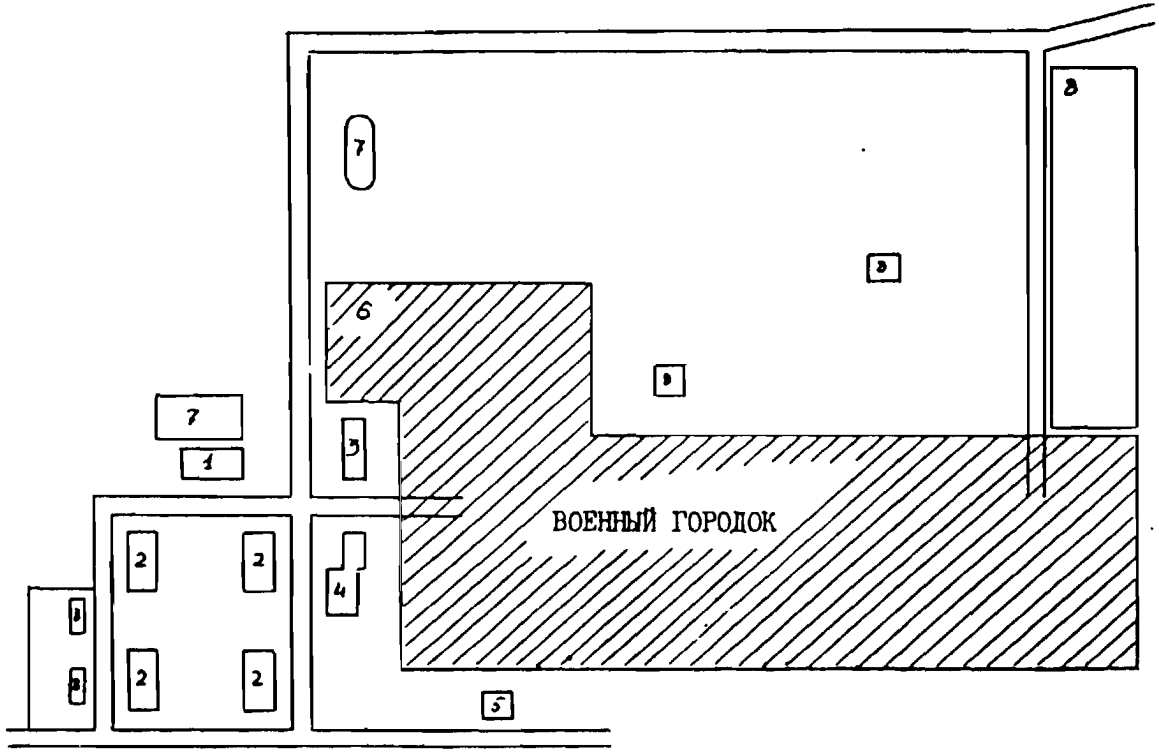


Figure 2. Diagram for the Living Quarters and for Equipment Preparation on the Semipalatinsk Test Site, with Indication of the Area of Free Movement




1. Hotel for U.S. designated personnel
2. Hotel for Soviet personnel
3. Laboratory
4. Dining room
5. Health room
6. Off-limits area (Military Settlement)
7. Sports area
8. Support workshops

## 27. REQUIREMENTS ON THE NUMBER OF PARTICIPANTS IN THE JVE AND PROCESSING PROCEDURES

1. Not later than 15 days prior to the agreed date of commencement of the JVE-related activities each side shall present to the other side a list of its proposed JVE Members who will make preparations and carry out the JVE. This list shall not contain at any time more than 100 individuals.

2. Each side, within 10 days after receipt of such a list shall review the list and inform the other of its agreement with or objection to the designation of each JVE Member proposed. Individuals who are objected to shall be deleted from the list. JVE Members shall be citizens of the visiting side.

3. Each side shall have the right to amend its list of JVE Members. New JVE Members shall be proposed and reviewed in the same manner as set forth in paragraphs 1 and 2 of this document with respect to the initial lists.

4. Within 10 days of receipt of the initial lists of JVE Members, or of subsequent changes thereto, the side receiving such information shall provide, or shall ensure the provision of, such entry/exit visas and, where necessary, other documents to each individual to whom it has agreed as may be required to ensure that each such individual may enter and remain in the territory of the host side for the purpose of carrying out the JVE. Such visas and related documents shall be valid for a period of up to six months. The visiting side shall ensure that such visas and related documents shall be used only for the purpose of carrying out JVE activities.

5. During the in-country period, the visiting side may substitute among individuals on the list of JVE Members at any time. The number of JVE visiting Members present at the site at any given time shall not exceed 45 persons.

6. In the event the Host Party determines that an individual on the list of the JVE members of the other Party has violated the conditions set forth in this Agreement and the Annex thereto governing JVE-related activities, or has ever committed a criminal offense on the territory of the Host Party, or has ever been sentenced for committing a criminal offense, or has ever been expelled by the Host Party, the Host Party making such a determination shall so notify the Visiting Party, which shall immediately strike the individual from the list of JVE members. If, at that time, the individual is on the territory of the Host Party, the Visiting Party shall immediately recall that individual and strike him from the list of JVE members.

## 28. POINTS OF ENTRY AND EXIT, TRANSPORTATION OF PERSONNEL AND EQUIPMENT FOR THE JVE

1. Points of Entry and Exit for Equipment and Personnel:

In the U.S. -- by sea -- Long Beach (California)
-- by air -- Washington, D.C. (Dulles Airport)

In the USSR -- by sea -- Nakhodka
-- by air -- Moscow

Because of the short period of time involved in conducting the JVE, the sides shall give preference to air transport for the delivery of personnel, equipment and instrumentation of the visiting side. Return transportation of personnel, equipment and instrumentation after the JVE shall be by the same mode, unless otherwise agreed.

2. The visiting side shall provide the host side with the following information on the cargo to be shipped:
-- list of equipment (trailers, containers, packages);
-- weight and size of each item;
-- recommended method of reloading (when necessary);
-- characteristics of specific cargo.

Outside marking of cargo should include the following:
-- address of recipient - sender (when necessary);
-- weight (gross), with indication of units;
-- gravity center (for large cargo);
-- indication of top and bottom (when necessary);
-- indication of hazardous cargo (radioactive, explosives, etc.).

3. Delivery of JVE instrumentation and equipment shall not be subject to the payment of duties, taxes or other similar payments to the extent it is permitted by the law of the host side.

The host side shall facilitate customs formalities for the visiting personnel and instrumentation and equipment brought in.

4. Equipment and instrumentation which the visiting side brings for the JVE shall be subject to selection/inspection procedures specified in document No. 33, "Procedure for the Selection and Inspection of JVE Experiment and Monitoring Equipment Conditions."

5. The host side shall provide:
-- transportation of equipment and instrumentation from the point of entry to the area of use in containers or other form of packaging in which they arrived, with additional sealing by the seals of the host side at the point of entry;
-- escort of equipment and instrumentation from the point of entry to the point of their installation and back. Representatives of the visiting side may escort their equipment and instrumentation during its transportation on the territory of the host side;
-- safety of equipment and instrumentation throughout the entire period of their presence on the territory of the host side;

-- escort of visiting personnel during their movement and travel in the territory of the host country.

6. Expenses related to the transportation of personnel, equipment and instrumentation for the JVE to the point of entry into the host country and back shall be borne by the visiting side.

Expenses related to the transportation of personnel, equipment and instrumentation in the territory of the host country shall be borne by the host side.

## 29. THE JVE PARTICIPANTS' LEISURE

1. The visiting side shall be allowed to bring three of its own video equipment units for viewing video cassette tapes. Each unit shall include a video cassette recorder with monitor, but without a video camera. This video equipment shall be used only in the living quarters of the visiting side.

The visiting side shall be allowed to bring its own tape players and broadband (540 kilohertz - 108 Megahertz) radio receivers, as well as video and tape cassettes.

2. Visiting side shall at its own discretion be allowed to ship newspapers, magazines and books for personal use of visiting personnel. The visiting side shall ensure the shipping of such printed matter into the host country and shall place the material in the custody of the host. The host side shall then ensure the delivery of such publications to the test site twice a week.

3. The video recordings, tape recordings, newspapers, magazines and books, specified in paragraphs 1 and 2, are intended only for personal use by the personnel of the visiting side. The visiting personnel shall be given the opportunity to become familiar with the newspapers, magazines and films of the host country, as they request.

4. The host side shall provide the opportunity to engage in athletic activities and to use the sports facilities available at the test site. For personal safety reasons it is recommended that personnel not jog or walk more than 3 kilometers from the living quarters area at the Semipalatinsk test site except when jogging or walking along the road leading to the living quarters area.

5. As requested by the visiting personnel, the host side shall arrange recreational trips to cities and sights in the host country at the expense of the visiting personnel. The location to be visited shall be subject to agreement between the sides, and routes of such trips will be decided by the Host side. Any such trips will be made only with escorts of the host country.

## 30. LIVING AND WORKING FACILITIES AND SUBSISTENCE FOR THE JVE PARTICIPANTS

1. The host side shall provide the personnel of the visiting side with living quarters which have been shown during the January 1988 familiarization visits to the sides' test sites. At the Nevada Test Site the Soviet personnel will live in Mercury. The U.S. personnel will live in living quarters of the Balapan testing area of the Semipalatinsk Test Site.

2. The host side shall provide the visiting side with working facilities which have also been shown during the familiarization visits, for laboratories, technical support, as well as for repair and storage of equipment and instrumentation.

In the laboratory compound at the Semipalatinsk Test Site, working space consisting of 11 rooms and a warehouse maintenance facility shall be allocated, with a total area of 300 square meters.

At the Nevada Test Site, four rooms and a warehouse/ maintenance facility with a total area of 5400 square feet shall be allocated, in addition to three trailers. Two trailers will be for office space and one for storage. Each trailer will have a floor space of approximately 500-600 sq. ft.

3. The host side shall provide food for the visiting personnel. To prepare special meals at the request of the visiting side's personnel in addition to food provided by the host side, the visiting side may include a cook among its personnel. The host side shall make it possible for the visiting side's cook to use kitchen equipment and dishes of the host side. The visiting side shall acquire the foodstuffs for preparing the aforementioned additional meals locally at its own expense or shall ship the foodstuffs into the host country. The host side shall ensure that the aforementioned foodstuffs are delivered to the test site once or twice a week.

At the Semipalatinsk Test Site the U.S. personnel will eat at the hotel where they will be living. Because of the continuous process of drilling, lunches for the U.S. personnel working at the drill rig will be provided at the drilling area. These personnel will eat their breakfasts and dinners at the hotel.

At the Nevada Test Site the Soviet personnel will eat in the cafeteria located in the vicinity of the hotel. On work days, Soviet personnel will eat in a forward area cafeteria or will be served lunches at the testing area.

4. The host side shall bear all expenses related to the provision of the visiting personnel with living quarters and working facilities, food (except where the visiting side chooses to make purchases locally) and other agreed services.

5. If the visiting side conducts seismic measurements at the host side's seismic stations, the host side will provide the visiting personnel with living quarters, food, and work space.

## 31. HEALTH PROTECTION AND SAFETY OF THE JVE PARTICIPANTS

1. The group of visiting personnel may at the discretion of the visiting side include a medical member to provide health care to the visiting personnel. To perform this function, this medical member shall be allowed to bring the necessary medications, instruments and portable medical equipment.

2. The host side shall ensure the visiting side personnel access to its medical facilities for treatment or hospitalization.

The visiting JVE medical member shall have the right to control the course of treatment of visiting personnel who become ill and are being treated in the medical facilities of the host side. This right includes evacuation of the ill member of the visiting personnel from the host's test site and the country as deemed necessary by the visitor's medical member. In all cases, with regard to the visiting personnel who become ill and are treated in the medical facilities of the host side, the opinion of the visitor's medical member takes precedence, up to and including the right to "veto" the treatment proposed by the medical members of the host side. When the right to veto is used, the visiting side shall bear the full responsibility for the patient.

3. To protect their health the visiting personnel shall follow all safety and radiation safety rules established at the host side's JVE facilities. An expert from the test site shall provide a briefing on the various safety measures to be followed in conducting the work and operations involved in the preparation and conduct of the JVE. Additionally the visiting personnel will be alerted by the host to any special sources of hazards.

4. The visiting personnel shall have host provided integrating dosimeters with them throughout their stay at the test site of the host side. The visiting side shall also be allowed to bring integrating dosimeters, protective clothing and footwear for all personnel, and portable radiation measurement instruments for use by radiation safety experts.

On the day of the test at the Semipalatinsk Test Site all JVE participants in the testing area shall wear protective clothing. (Except for footwear, at the Nevada Test Site there are no requirements with regard to clothing.)

In carrying out some operations at the Nevada test site the JVE participants must wear protective footwear. (At the Semipalatinsk test site there are no requirements with regard to footwear.)

## 32. MISCELLANEOUS ISSUES RELATED TO THE PREPARATION AND CONDUCT OF THE JVE

1. Sole and exclusive control over and full responsibility for the conduct of the nuclear test.

The host side shall have exclusive control over and full responsibility for the conduct of the JVE explosion, for the public safety precautions associated with the test, and for ensuring safe working conditions for JVE participants and other personnel on the test site. In particular, the host side shall have final authority over detonation of the nuclear explosive device and for assuring that all established safety conditions are fulfilled.

The visiting personnel shall act in accordance with procedures established at the test site of the host side, agreements reached by the delegations, and decisions adopted jointly by the senior test site representative and the visiting personnel team leader.

2. Provision for communication between the trailers and the control point.

The host side shall ensure telephone communication for the visiting personnel between all living and working facilities which will be used by the visiting personnel, including control point, measuring trailer(s), and other facilities used by the visiting side in the JVE.

3. Photographic documentation of operations.

The visiting personnel shall have the right to obtain photographs of operations executed during the preparation for the JVE. Photographs shall be made by the host side of the operations designated by the visiting side. Two copies of each photograph taken shall be made, one for each side.

Prior to the end of any operation being photographed, and prior to the time when any object being photographed shall become permanently hidden from view, the visiting personnel shall determine whether the requested photographs are adequate and, if not, the host shall take additional photographs. This process shall be repeated until the visitors are satisfied that the photographs are adequate.

4. Other visitors to the test site.

In the course of the preparation for the JVE and during its conduct, the visiting side's official representatives not participating in the JVE may be present as guests. The list of such individuals shall be determined by agreement between the sides. The number of these official representatives shall count toward the established quota of 45 visiting personnel authorized to be present concurrently at the test site, unless otherwise explicitly approved by the host side.

## 33. PROCEDURE FOR THE SELECTION AND INSPECTION OF THE JVE EQUIPMENT AND MONITORING EXPERIMENT CONDITIONS

This document contains agreed upon measures for ensuring host side selection and inspection of JVE equipment and instrumentation and visiting side monitoring of the conditions for the preparation and conduct of the experiment. These procedures are agreed to only for the JVE.

### I. Selection and Inspection of Recording Instruments for Hydrodynamic Yield Measurements and Associated Equipment for Calibration and Repair

The visiting side shall provide two identical sets of equipment in this category. Each set shall include:

For U.S. side - All equipment and instrumentation located in the recording station and control and monitoring facility.

For the Soviet side - All equipment and instrumentation located in the instrumentation complex SG112A1.

No later than 30 days prior to shipping its equipment, the visiting side shall provide a description that will allow the host side to determine its functional and operational purpose.

No later than a week prior to shipping the equipment the visiting side shall provide the host side with a complete itemized list of the equipment, identifying any items that are not essential at the time of the explosion and that shall be removed prior to the explosion according to Section VIII of this document.

Upon the arrival of the two sets of equipment at the point of entry, the host side shall select one set to be used by the visiting side during the JVE. This set shall not be subject to inspection by the host side at this time, but shall be sealed by both the visiting and the host side at the point of entry and shall be delivered to the test site of the host country under escort of personnel from both sides. Following the JVE explosion, this set of equipment shall be subject to inspection by the host side for a period of up to 30 days. This period shall begin after the completion of preliminary processing of hydrodynamic measurement results of JVE by the visiting side and the exchange of yield estimates as provided for in paragraph 11 of document No. 22, "Procedures for Exchanging Data During the Preparation, Conduct, and Processing of the Results of the JVE." As specified in that paragraph, this exchange shall occur within ten days of the explosion. After the 30 days allowed for host side inspection of the equipment, it shall be returned without delay.

The set of recording instruments not selected for the use of the visiting side may be retained by the host side upon its arrival at the point of entry for inspection for a period of up to 30 days. It shall then be returned without delay.

The personnel of the visiting side shall not be present during the inspection of either of the two sets of equipment by the host side.

At the end of the time period provided for the inspection of each set, these sets shall be returned undamaged to the visiting side at the point of exit, where the visiting side shall be allowed to ascertain normal functioning of the recording instruments.

## II. Downhole Equipment, Cables and Sensors

Downhole equipment, cables and sensors of the visiting side to be used during the JVE shall be inspected in accordance with this section. A complete itemized list of this equipment shall be provided by the visiting side at least one week prior to shipment. All such equipment, cables, and sensors not provided in two sets shall be provided by the visiting side at the point of entry in sufficient quantities to allow the host side to select any 25 percent of each item of the equipment, to be retained and inspected by the host side as it desires. All remaining units of the equipment shall be sealed by both sides and shipped to the host's test site under escort of personnel of both sides.

The seals shall be removed from these sealed units of equipment only when it shall be necessary to check out and subsequently install this equipment during downhole operations. The removal of seals and installation of these equipment units shall be conducted in the presence of personnel from both sides.

If two sets of equipment in this category are provided by the visiting side, the appropriate procedures described in Section I of this document for selection and inspection of this equipment and the sealing requirements described in this section shall be followed.

The host side shall decide on the procedure for further use of the equipment selected for inspection.

## III. Other Equipment

At the option of the visiting side, either one or two sets of equipment other than hydrodynamic yield measuring and recording equipment may be provided. The list of such equipment shall be provided and agreed upon by both sides at least one week prior to shipment.

If only one set of equipment is provided by the visiting side, the host side shall have the right to perform an inspection of this equipment upon its arrival at the point of entry for up to 30 days, without presence of visiting side personnel. Any equipment capable of performing functions unacceptable for the JVE shall be identified by the host side at the point of entry and removed by the visiting side. Upon completion of the inspection, the acceptable equipment shall be shipped to the host's test site and given over to the visiting side undamaged.

If two sets of equipment in this category are provided by the visiting side, the procedures described in Section I of this document for selection and inspection of this equipment shall be followed.

## IV. Escorting of Equipment

Visiting personnel shall have the right to escort their set of recording instruments and equipment for hydrodynamic yield measurements and associated equipment for calibration and repair during its transportation by the host side from point of entry to the host's test site and back to the point of exit, as provided for in the document No. 28, "Points of Entry and Exit, Transportation of Personnel and Equipment for JVE." The right to remain with the equipment shall not extend to any equipment during the period it is subject to inspection only by the host side in accordance with Sections I, II, or III of this document.

## V. On-Site Surveillance of Equipment

The visiting side shall have the right to remain with its recording instruments and equipment for hydrodynamic yield measurements from the time the instrumentation and equipment arrives at the host's test site until the JVE explosion, except during the periods when the trailer park area is closed to all personnel. If required to leave the trailer park during these periods, the visiting personnel shall be allowed to accompany the last host personnel leaving the JVE area and, when re-entering, to accompany the first host personnel entering the JVE area. During these periods, the visiting side shall be allowed to monitor its trailer and experiment configuration via closed circuit television. When it is planned to close the testing area for the JVE explosion, the visiting personnel in the presence of the personnel from the host side shall carry out final operations in the recording trailer and shall also verify the integrity of cables and their connections to the hydrodynamic measuring equipment on the ground surface. After performing these operations, the visiting personnel shall depart the test area among the last host personnel departing the JVE area.

After the JVE detonation, the representatives of both sides shall accompany the first personnel to return to the trailer with recording instruments for hydrodynamic yield measurements, and the visiting personnel shall retrieve the data under observation by host personnel.

Personnel of the host side shall accompany any visiting side personnel who may be present at any time after the JVE explosion, in the JVE trailers, wherever located during the preliminary processing of JVE hydrodynamic measurement results.

## VI. Surveillance of the Satellite Hole, Emplacement Hole, and Cables

If feasible, the visiting side's recording trailer shall be located in such a way as to ensure unobstructed observation of the satellite hole, emplacement hole, and measuring cables. In the event that the location of the satellite hole and emplacement hole relative to the recording trailer does not provide the possibility of such observation, the sides shall agree on adequate video coverage. Personnel of the visiting side shall have free access to the cableway dedicated exclusively to its cables to perform inspections. If host side personnel have need to gain access to the visitor's cableway, this access shall be under escort by the visiting personnel.

## VII. Remote Control Monitoring of the Recording Trailer

If general instrument monitoring is required at the Nevada Test Site by Soviet designated personnel the U.S. will provide monitoring channels from the Soviet recording trailer to the control point.

## VIII. Removal of Prohibited Equipment

Some equipment, due to its recording band width, may be deemed unacceptable by the host side for use at the host's test site during the JVE explosion. In such case the equipment shall be identified by the host side at the time of initial inspection and shall be removed by the visiting side and placed in the custody of the host side prior to the final dry run or at least one day prior to the JVE explosion.

Equipment and procedures included in this category shall be set forth in document No. 24, "Anti-Intrusiveness Measures for the JVE at the Nevada Test Site and Semipalatinsk Test Site."

III

## 34. PROCEDURE FOR RESOLVING QUESTIONS ARISING AT THE TEST SITES OF THE SIDES DURING THE PREPARATION AND CONDUCT OF THE JVE

1. The visiting side team leader and a senior representative of the host side test site designated by the host side shall meet at the test site at least once each day during JVE activities at the test site to analyze the implementation of the schedule of operations and to discuss and attempt to resolve any questions that may arise with respect to the preparation and conduct of the JVE.

2. In the event that the team leader of the visiting side and the senior representative of the host side are unable to resolve any such question, then at the request of either side that question shall be referred for resolution to the U.S. Department of Energy (telephone number 202-586-8100, Center for JVE Affairs) and to the USSR Ministry of Foreign Affairs (telephone number 244-26-94, The Department on Peaceful Uses of Nuclear Energy and Outer Space).

Thereupon the sides shall take measures to resolve the question in a timely fashion in a manner acceptable to their respective countries. Until resolution of the question, work activities on the aspects of the JVE to which the question pertains shall be suspended.

## 35. DISTRIBUTION OF THE JVE COSTS BETWEEN THE U.S. AND USSR

1. The following cost distribution agreement applies only to the JVE.

2. All renumeration to JVE participants shall always be paid by the side to which the personnel belong.

3. The U.S. and USSR have agreed on the JVE cost distribution as follows:

| | ACTIVITY | COST RESPONSIBILITY |
|---|---|---|
| 1. | Transportation of personnel and equipment to the point of entry when entering the host country and from the point of entry when leaving the host country. | Visiting side |
| 2. | Transport of the personnel and equipment within the host country | Host side |

| | | |
|---|---|---|
| 3. | Costs related to the stay and activities of the visiting personnel for:<br><br>- housing and provision of services<br>- facilities<br>- food (except special purchases by visiting side)<br>- communications (including the host side's charges for OPX lines)<br>- local transportation<br>- necessary support related to the conduct of tests, including power equipment, power supplies, materials ,etc. | Host side |
| 4. | Drilling of the satellite hole at the Nevada Test Site. | USA |
| 5. | Transportation of U.S. drilling and logging equipment to the Soviet Union (if U.S. drilling of a satellite hole at the Semipalatinsk test site is necessary) | USA |
| 6. | U.S. Drilling of the satellite hole at the Semipalatinsk Test Site (if this activity is necessary) | USA |
| 7. | Support and supplies for the U.S. drilling/logging personnel for drilling and logging of the satellite hole at the Semipalatinsk Test Site. | USSR |
| 8. | Rotation of visiting personnel at the request of the visiting side. | Visiting side |
| 9. | Recreational trips of the visiting personnel to the cities and sites of the host country, as requested by the visiting side. | Visiting side |
| 10. | Mailing of newspapers, magazines, books and food packages for the visiting side: | |
| | To the point of entry | Visiting side |
| | From the point of entry to the test site. | Host side |
| 11. | Any acquisition of specialized equipment and instruments by the visiting personnel in the host country. | Visiting side |

## 36. ESTIMATED SCHEDULE FOR PREPARATION AND CONDUCT OF THE JVE AT THE NEVADA TEST SITE AND THE SEMIPALATINSK TEST SITE.

The major steps in preparation and conduct of the JVE are listed here, with scheduled dates as we currently envision them. Little detail has been included; a large number of tasks will be going on concurrently.

A minimum of four weeks (preferably six) must separate the two explosions, because key hydrodynamic measurement personnel must be present at both explosions for final preparation, explosion conduct, and data interpretation. In this schedule the explosion at the Semipalatinsk Test Site follows that at the Nevada Test Site by four weeks.

<u>At the Nevada Test Site</u>

| | | |
|---|---|---|
| 1. | Present Soviet technical requirements | 4/20 |
| 2. | Design, build canister and rack | 3/07 - 5/23 |
| 3. | Drill, core and log satellite hole | 4/18 - 6/30 |
| 4. | Log and sidewall-core emplacement hole | 4/25 - 5/30 |
| 5. | Carry out preparatory work; prepare cables and trailer park by the host side | 4/20 - 6/13 |
| 6. | Transport Soviet hydrodynamic equipment to Nevada Test Site; prepare and check-out hydrodynamic equipment | 6/14 - 7/09* |
| 7. | Check-out canister and rack at top of hole | 6/24 - 7/19 |
| 8. | Designate five seismic stations and identify five historic explosions | 5/24 |
| 9. | Emplacement and stemming in satellite hole | 7/05 - 7/16 |
| 10. | Emplacement and stemming in emplacement hole | 7/20 - 8/15 |
| 11. | Complete exchange of historic seismic data | 6/28 |
| 12. | Detonation | 8/17 |
| 13. | Preliminary processing of hydrodynamic measurements results, analysis and exchange of seismic data | 8/17 - 8/27 |

<u>At the Semipalatinsk Test Site</u>

| | | |
|---|---|---|
| 1. | Present U.S. technical requirements | 4/20 |
| 2. | Transport drill rig to Semipalatinsk | 5/03 - 5/09 |
| 3. | Prepare for drilling satellite hole | 5/09 - 5/17 |
| 4. | Drill, core, log satellite hole and log the emplacement hole | 5/17 - 7/07 |
| 5. | Carry out preparatory work; prepare cables and trailer park by the host side | 4/20 - 7/30 |
| 6. | Designate five seismic stations and identify five historic explosions | 5/24 |
| 7. | Transport U.S. hydrodynamic equipment to Semipalatinsk Test Site; prepare and check-out hydrodynamic equipment | 8/04 - 8/28* |
| 8. | Complete exchange of historic seismic data | 6/28 |
| 9. | Emplacement and stemming in emplacement hole | 8/19 - 9/09 |

| | | |
|---|---|---|
| 10. | Emplacement and stemming in satellite hole | 8/28 - 9/11 |
| 11. | Detonation | 9/14 |
| 12. | Preliminary processing of hydrodynamic results, analysis and exchange of seismic data | 9/14 - 9/24 |

The sides recognize that circumstances beyond the control of either side may cause delays in JVE operations at either test site, thereby leading to changes in the agreed schedule. Under such circumstances the sides may amend the schedule without requiring formal amendment to the JVE Agreement.

* No time has been included here for inspection of equipment by the host side at the point of entry.

## IV

## 37. RELEASE OF JVE-RELATED INFORMATION

Information produced by either side, pursuant to, or as a result of this Agreement, shall be held in confidence by both sides subject to the following conditions. Public release of information produced by either side pursuant to this Agreement, disclosure or dissemination of such information to other sides, or publication of any material using such information may take place with the prior agreement of the other side. After the conclusion of each JVE explosion, each side has the right to issue a general statement on its participation that does not divulge any information produced by either side pursuant to this Agreement.