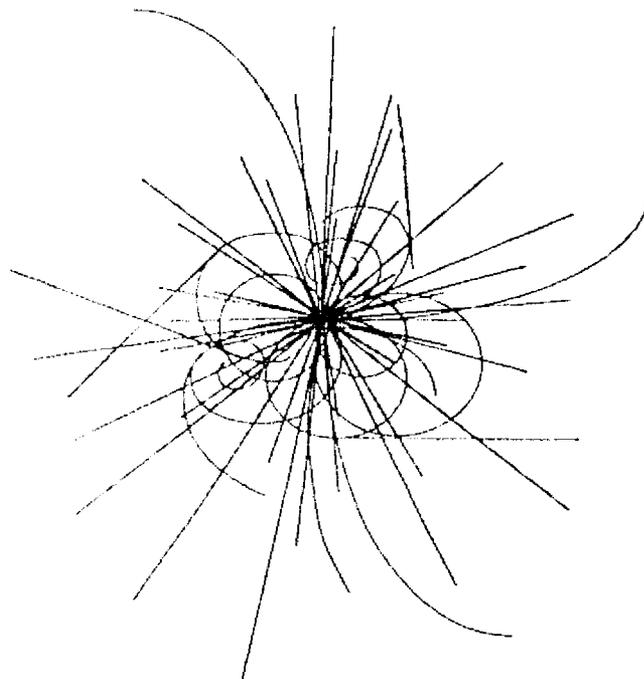


SSC PROJECT
MONTHLY PROGRESS
REPORT
DECEMBER 1989



SSC

LABORATORY

SSC PROJECT

MONTHLY PROGRESS REPORT

Table of Contents

<u>Section</u>	<u>Title</u>	<u>Page</u>
I.	EXECUTIVE SUMMARY	1
II.	TECHNICAL SYSTEMS.....	2
III.	CONVENTIONAL CONSTRUCTION.....	7
IV.	PROJECT MANAGEMENT AND SUPPORT	12
V.	R&D AND PRE-OPERATIONS.....	25
VI.	EXPERIMENTAL SYSTEMS	36
VII.	LAB OPERATIONS SUPPORT.....	37
VIII.	COST/SCHEDULE NARRATIVE	40
IX.	COST/SCHEDULE DATA	
	1. CPR, Format 1	45
	2. CPR, Format 2	58
	3. Major Subcontractor List.....	59
X.	MILESTONE STATUS Reports.....	60
XI.	MEETINGS AND EVENTS.....	69

EXECUTIVE SUMMARY

Work on the Site-Specific Conceptual Design Report (SCDR) and cost estimates for the 20 TeV design, a 17 TeV design and a \$5.9B design (less than 15 TeV) were in progress this month. Baseline parameters, summary cost and detailed cost were reviewed by DOE on December 6-8. Secretary Watkins visited SSCL on December 12 to review the status of the site-specific design and the cost estimates. The final draft of the SCDR was completed by December 20; the cost estimates were to be complete in time for the January 9-12 baseline review. Revision 5 of the Project Management Plan was also completed.

Tracking studies of Collider beam were extended to the six million turn level, with results indicating that a magnet aperture larger than 4 centimeters is needed.

An Ad Hoc Committee on SSC Physics and the Scientific Policy Committee met in December; both recommended strongly that the Collider beam energy not be reduced below 20 TeV. The Machine Advisory Committee recommended that the Collider magnet aperture be increased from 4 to 5 centimeters and that the Collider injection energy be increased from 1 TeV to 2 TeV.

The specified aperture of the High Energy Booster magnets was reduced from 7 cm to 5 cm, equal to the recommended Collider magnet aperture.

Tests of magnet DD0019 showed retraining effects which are believed to be due to the high manganese content of the stainless steel in the collars, which shrank less than the coil upon cooling, resulting in a low prestress. Cross flow cooling was tested in DD0019 with encouraging results, indicating that this transverse flow of helium may help deal with the expected SSC synchrotron radiation heat load.

The Acquisition Strategy for the Collider dipole magnets was presented to DOE on December 20. Approval was granted to select a single contractor for magnet development; two sources will be qualified for production.

Twenty-two people were hired in December and 33 more accepted job offers.

TECHNICAL SYSTEMS (WBS 1.0)

ACCELERATOR SYSTEMS (WBS 1.1)

(SEE SECTION 4.0 - R&D PRE-OPERATIONS)

MAGNET SYSTEMS (WBS 1.2)

- **MANAGEMENT AND SUPPORT (WBS 1.2.1)**

Presented the Acquisition Strategy for the Collider Dipole Magnets to DOE on 20 Dec 89. Subsequently we received approval to select a single contractor for development, and plan to qualify a second source for production.

- **HEB MAGNETS (WBS 1.2.2)**

A major change in the requirements for the HEB magnets took place in December. The aperture of these magnets has been reduced from the original 70mm to 50mm. In this case the HEB dipoles will have approximately the same mechanics as the Collider dipole magnets. However the special bipolar and rapid cycling requirements of these magnets remains and require additional characterization of the cable. One possible approach which would yield early information in the area is to introduce rapid cycling test sequences in the present collider dipole test program to be used as a baseline for possible improvements. This option is being seriously considered.

- **COLLIDER MAGNETS (WBS 1.2.3)**

TEST

No SSCL magnet testing had been planned for December at FNAL due to facilities commitment to other FNAL programs. However an abrupt change of schedule occurred and testing of magnet DD0019 was continued. The fourth cooldown of DD0019 was performed without a restriction on the temperature difference between the two ends of the magnet. Typically, the normal cooldown rate had been limited to maintain the temperature difference below 125K; during the unrestricted cooldown a maximum difference of 290K was observed. At the nominal operating temperature of 4.35K, the first quench following cooldown was at 6400A, significantly below the short sample plateau reached during the previous test cycles.

The second quench, at 6596A, was above the 6500A collider operating current. By the fourth quench the magnet was back at the conductor limit of about 6740A.

• COLLIDER MAGNETS (WBS 1.2.3) - Continued

TEST (continued)

In the previous test cycle, DD0019 exhibited only minor re-training, the first quench following a normal cooldown occurring at a current only 30-40 amps below the short sample limit. While there was only one quench below operating current following the unrestricted cooldown, the re-training observed was more than was expected and thus warrants further investigation.

The magnet was subsequently cooled to 3.8K, reaching a plateau current of about 7270A after two quenches and then to 3.5K where the first quench was at 7540A in the lower outer coil. Four more quenches were taken at 3.5K with currents varying over a range of several hundred amps indicating some mechanical instability. The magnet temperature was then returned to 4.35K and following the first quench at 5838A (a surprisingly low current), DD0019 returned to its short sample limit; a total of five plateau quenches were taken.

While analysis of the data is still in progress, the strain gauge data obtained give some indication as to the origin of the observed effects. Magnet DD0019 was constructed with high manganese content stainless steel collars (providing improved magnetic properties and greater yield strength) as was magnet DD0026, discussed in last month's report. This stainless steel has a thermal expansion coefficient which is nearly a factor of two less than that of the stainless steel (Nitronic 40) normally used in collars. The smaller thermal coefficient means that the coil shrinks considerably more than the collars and the magnet exhibits a greater loss of coil clamping pressure on cooldown. In addition, the initial clamping pressure obtained was 8000 psi (warm), at the low end of the acceptable range. The clamping force reduces to very low values at currents near and above the nominal operating point and it appears that the coils were not sufficiently clamped at the highest currents. Thus while most of the 4.35K quench performance is quite acceptable, the mechanics of this magnet (lower initial clamping force coupled with the thermal properties of the high manganese content stainless steel) were not as robust as the normal baseline design and it did not perform as well in tests at the lowest temperatures (at currents which subject the magnet to force levels 33% greater than those at the nominal operating current).

DD0019 was cooled down with a 'warm insert' in the magnet beam tube to allow magnetic measurements. The warm insert is designed to insulate the measuring device from the 4.35K temperature of the cold mass. During the quench testing discussed above, the warm insert was evacuated providing no heat leak into the magnet. The iron yoke blocks in DD0019 were assembled with sets of deflecting inserts between them to direct the helium flow transverse to the long axis of the magnet and more effectively remove heat from the region of the coil. This scheme, known as 'cross flow cooling', has been developed to remove the synchrotron heat load which is produced by the collider beams at the highest energies.

Following the completion of the quench program discussed above, the warm insert was opened to ambient temperature (as required for magnetic measurements) and several quenches were taken. At 4.35K, the quench currents observed were about 6420A, a reduction of about 300A from the plateau observed with no heat leak from the warm insert. For comparison, under similar conditions, but without cross flow cooling, magnet DD0017 quenched at a current of about 5800A, a more than 800A reduction from its short sample plateau at 4.35K. Reducing the feed end temperature to 4.0K, the quench current returns to the value obtained at 4.35K.

• COLLIDER MAGNETS (WBS 1.2.3) - Continued

TEST (continued)

with the warm insert evacuated. While the heat leak of the warm insert is not well known, it has been estimated to be about 20W, roughly ten times greater than that expected from synchrotron radiation under nominal collider operating conditions. These results are quite encouraging; more detailed measurements of the efficacy of the cross flow cooling scheme are planned for a magnet test to be performed at BNL.

A working meeting of the Magnet Components Data Base (MagCom) programmers was held at SSCL on Dec. 5 - 8, 1989. The group met on two mornings for discussions of general philosophy, current status, and setting priorities for the next tasks.

Arrangements were made with the Computer Systems group to assign a DecNet node and name for the data base server, the SUN workstation named grumpy; it can now be accessed by SET HOST SSCSUN from any DecNet VAX.

Several forms and reports that will become part of a menu-driven user-friendly data access system were produced. These include a data entry/editing form for the coil winding data table (which specifies the cable that was used) and reports that display cable electrical and magnetization test data for a specified cable. The magnet summary report that lists the cable in each magnet and measured values for important cable parameters was revived.

It was decided to hold a meeting of SSC data base developers and users from other groups and labs on February 14 & 15 at SSCL, following the Magnet System Integration meeting. This will allow workers to learn what their collaborators are developing, and to share tips and utility programs for the Sybase data base system. Announcements were sent by computer mail on January 2; the contact person is Penny Baggett (SSCVX1::BaggettP).

QA

SSCL QC Engineers who are temporarily staffed at BNL and FNAL continued their familiarization activities. This includes involvement with all assembly and manufacturing processes for the dipole magnet. The chief goal is to understand processes such as wire inspection, cable wrapping, curing, coil inspection, etc., such that proper QC measures can be applied and verified later during magnet production performed under contract. As an aide to the QA assignment at BNL, inspection and testing procedures have been written for the revised magnet beam tube material specification and a rough draft of the copper beam tube plating specification is in progress.

Cable database development continues with development of quality analysis software tools. SYSTAT software was placed on order. The analysis capability will cover data collected at wire vendors and during cable insulation and cable test. Forms for the manual collection of data at the vendors have been completed. The data collection will be used for quality analysis of wire and cable. Direct statistical process control will eventually be implemented when the data is electronically acquired during various manufacturing processes.

- **COLLIDER MAGNETS (WBS 1.2.3) - Continued**

QA - continued

A quality assurance checklist for use in hardware procurement has been completed. The checklist is designed to be used by engineers during specification development and to be used as a contract requirement with purchase orders requiring QA coverage.

The QA Group Leader visited DESY and HERA in December. The visit included tours of the magnet measurement hall and the tunnel. Receipt inspection, alignment and cold testing of HERA dipoles was observed in-process.

MANAGEMENT

No report this month.

ENGINEERING

Extensive discussion has taken place regarding the performance of the 40mm collider design. Accelerator requirements indicate that a 50mm aperture is needed and the engineering group is actively pursuing design to satisfy this need. In addition the accelerator lattice now requires two magnet lengths one at 15.6m and another at 13.1m. A schedule to establish the appropriate design and produce 1.8m models of this design is in place.

In preparation for release of the RFP for the collider dipole magnet, a final draft of this magnet has been completed. To accommodate the two magnet lengths, two separate specifications have been established. Both specifications are being modified to reflect the new 50mm aperture requirement. Progress on two other specifications has been made during the month: revision to the CAD system specification continues with target completion by the end of January; the specification for a document storage system has been completed.

Work has been initiated on a field quality sensitivity/trade-off study with the goal of assessing the potential for improved and controllable field quality. Design effort has begun on the magnet support stand in conjunction with the ASD personnel. In light of the above magnet changes, the cryostat support system evaluation has changed direction.

Staffing and personnel training (both 3D and solid modeling) have progressed well during this month. Three individuals in the systems engineering section have accepted offers and will start in January. Offers to three section managers (materials, analytical support and superconducting technology) are pending DOE approval and it is anticipated that these positions will be filled in the next few months.

- **MAGNET FACILITIES EQUIPMENT AND TOOLING (WBS 1.2.4)**

Work continues on the magnet "workshop" at the SSC Lab in Dallas. A lease agreement for 5600 sq. ft. of space in Stone Ridge Bldg. #2 is currently awaiting approval. Equipment and tooling necessary to support the teardown and failure analysis of DD0018 has been defined and procurement initiated.

- **COLLIDER MAGNETS (WBS 1.2.3) - Continued**
- **MAGNET FACILITIES EQUIPMENT AND TOOLING (WBS 1.2.4) - Continued**

Preparation of RFPs for the coil winder, cure oven and collaring press continued during December.

Fourteen of the twenty-two vendor RFQs were answered on December 7, 1989. However, due to specification questions, the bid period was extended to January 5, 1990.

Work continued on the definition of the Magnet Test Laboratory (MTL). The second draft layout of the MTL Facility was reviewed on December 13, 1989. With a few modifications the layout was accepted and work will commence on detailed layouts by individual work areas.

CONVENTIONAL CONSTRUCTION (WBS 2.0)

• DIVISION MANAGEMENT & ADMINISTRATION (2.6.1.1)

In addition to ongoing routine administrative activities, technical editing and clerical support was provided for the preparation of Chapter 6 of the December 20 final draft of the Site-Specific Conceptual Design Report (SCDR). Editing and clerical support was also provided for the preparation of the first draft of the procedural guidelines manual, the Magnet Development Laboratory (MDL) design criteria, and several prototype architectural programming requirements documents under development.

• PROJECT CONTROLS GROUP MGMT & ADMINISTRATION (2.6.1.2)

The Conventional Construction Division (CCD) cost and schedule network structures were completed. Included in these network structures are the durations of various design/construction activities, their associated logic connectors, their organization breakdown structure/work breakdown structure (OBS/WBS) linkages, and their estimated costs. CCD's portion of the cost reporting system was restructured and re-formatted to make it conform to a DOE-approved electronic format. The first revision of the CCD FY90 budget was prepared. As part of this effort, the inputs of CCD cost account managers were reviewed. The cost estimating group continued intensive restructuring of the baseline cost estimate for the CCD in support of the DOE briefings to be held January 9-11, 1990.

• DESIGN OVERSIGHT GROUP MGMT & ADMINISTRATION (2.6.1.3)

Activities during December included the following:

- Continuing participation on the SSCL engineering standards committee to develop a lab-wide plan for document control, title blocks, etc.
- Continuing development of a plan for interfacing and coordinating SSCL Divisions and the Architect-Engineer/Construction Manager (A-E/CM). This plan will form part of the CCD procedural guidelines.
- Maintenance of continuity on activities within design oversight, including participation at meetings and intermittent review of ongoing work.
- A plan for CCD usage of computer-assisted design (CAD) was developed.
- Current and future manpower requirements were reviewed.

• CONSTRUCTION OVERSIGHT GROUP MANAGEMENT & ADMINISTRATION (2.6.1.4)

The first draft of the CCD procedural guidelines was completed. The first meeting of the Prototype Installation Facility (PIF) task force was initiated, and issues were defining related to construction of the first tunnel sector and subsequent sectors.

CONVENTIONAL CONSTRUCTION (WBS 2.0)

(CONTINUED)

• MAJOR STUDIES (2.6.2)

Building Space Requirements

Identification of operational stage SSC building population levels and building space program requirements.

- The SSC Surface Facilities Programming Report remains at the 85% completion level pending the impact of program changes and adjustments.
- Additional refinement will carry this work element well into February 1990.

Utility Requirements

Identification of SSC utility requirements (water, sewage, electrical, HVAC, communications, natural gas, compressed air, and solid waste).

- A second draft of the SSC Water and Sanitary Sewer Study Report was circulated for SSCL division review. It was then revised to incorporate comments and design/system changes identified in the most recent draft of the SCDR.
- Studies addressing SSC electrical supply requirements continued.

Overall Site Development Plan

- Prepare an overall Site Development Master Plan Report for the entire SSC fee simple land area which will serve as guidance to the A-E/CM contractor and the DOE 4300.1B Site Development Planning requirement.
- Activity on this work element was temporarily postponed pending management direction on the desired scope and DOE requirements.

Vegetative Stabilization Program

Will involve site-specific study and design of revegetation and stabilization of SSC spoils disposal sites located at service areas and the east and west campus sites.

- This element will be primarily accomplished by a subcontractor who has not yet been selected. No activity occurred during December on this activity.

CONVENTIONAL CONSTRUCTION (WBS 2.0)

• MAJOR STUDIES (2.6.2) - continued

Study Management

Provides for the CCD Special Studies Manager's oversight and direction of all 2.6.2 major study assignments.

- Research was conducted into DOE policy, standards, and criteria for facility planning and special engineering studies.
- After detailed analysis, a memorandum was written January 3, 1990 recommending major study topics for FY90.

• DESIGN CRITERIA (2.6.3)

This element includes work for the SCDR and preparation of design criteria for use by the A-E/CM.

The third draft of the SCDR was revised to incorporate ongoing technical systems modifications. Water and power requirements were substantially reduced from previous estimates as a result of helping Accelerator Division more completely refine the conceptual design. Work began in assisting the technical divisions in developing alternatives and means for meeting budgetary requirements, and these facility requirement modifications were then coordinated with the baseline cost estimates.

Work was continued for developing underground and surface facility concepts for the L* detector. The development of facility concepts for the EMPACT detector began at the end of the month.

A task force was created in December to initiate conceptual design of the prototype installation facility (PIF). This tunnel sector runs from slightly before service area E-1 to slightly past service area E-2. Plans call for it to be completely finished so that prototype magnets can be installed and tested inside it. The first meeting of the PIF task force was held in December, and a framework was established for defining programming requirements for both underground and above-ground structures. A set of typical structures was defined. These include a typical niche and alcove, an E site shaft, an F site shaft, the radio frequency (*rf*) shaft, the tunnel cross section, tunnel shaft connections for E and F type shafts, and the E and F shaft service area surface structures.

• DESIGN OVERSIGHT (2.6.4)

Study began on the underground structure requirements in the transitional area between the HEB and the collider ring. As a result of an intensive design effort through December, the location and size of four kicker galleries, three *rf*/klystron galleries, two injector transfer tunnels, two abort tunnels, and one test beam conduit intersection tunnel were determined. This information was inputted on the computer-assisted design (CAD) system to produce three-dimensional models. All of this work is needed to refine the baseline cost estimate, because the location and size of these underground structures had not been previously determined in the 1986 Conceptual Design Report (CDR) or the SCDR.

CONVENTIONAL CONSTRUCTION (WBS 2.0)

(CONTINUED)

• CONFIGURATION MGMT & INTERFACE CONTROL (2.6.6)

Interface Control

Establishment of the format of Interface Requirements Drawings and Interface Control Drawings and coordination with the Design Criteria effort.

- This effort had been anticipated to begin in December 1989. At the end of the month however, further work was awaiting lab-wide approval of the Configuration Management Plan.

Configuration Management

Configuration Control Board activities and Change Proposal evaluation.

- This effort is not anticipated to begin until April 1990.

• GEOTECHNICAL PROGRAM (2.6.8)

Program Oversight

Geotechnical field activity and laboratory activity continued into December. Three exploratory borings were drilled in the injector area. At the service areas, a boring was drilled and completed at E-8, and drilling began at the E-2 and F-6 sites. Downhole dilatometer testing was completed for all of the service area borings.

As a result of the December 14-15 meeting of the Underground Technology Assessment Advisory Panel (UTAP), consensus was reached among the panel in favor of a proposal put forth by the SSCL that the first tunnel segment be finished to a degree that would allow it to be used as a prototype test facility. Various construction interface schemes that would allow for construction to continue on the rest of the ring without disrupting use of the first segment were proposed by CCD staff at the meeting.

The feasibility of an 8-12 ft diameter shaft to contain instrumentation that would report both ground movement during excavation and long-term movement was examined. It was decided that a shaft location should be chosen that will provide the most information possible on both the Austin chalk and the Eagle Ford shale. The information taken from the shaft will have direct applicability to tunnel, shaft, and experimental hall design and construction.

• A-E/CM SELECTION & CONTRACT ADMINISTRATION SUPPORT (2.6.10)

Activities include administrative support for the A-E/CM Selection Board and support in the development of the A-E/CM contract Scope of Work.

CONVENTIONAL CONSTRUCTION (WBS 2.0)

(CONTINUED)

• A-E/CM SELECTION & CONTRACT ADMINISTRATION SUPPORT (2.6.10) - Continued

Activities in December included the following:

- Administrative assistance to the A-E/CM Selection Board.
- Support to the A-E/CM Evaluation Board as Technical Advisor.

• SEIS SUPPORT (2.6.12)

SEIS Support Management

This element provides for the CCD SEIS support manager's oversight and direction of all 2.6.12 SEIS support assignments and also creates a fund for yet-to-be assigned FY90 SEIS support tasks.

Meetings were held with Argonne National Laboratories (ANL) to answer questions about the CCD Supplemental Environmental Impact Statement (SEIS) Data Requirements submittal to ANL (Volumes I, II, III, and IV) dated October 20, 1989 and transmitted by the SSCL/EAO on October 25, 1989. Additional refinement and checking of the ANL October 25, 1989 submittal was completed.

SEIS Spoils Management

This element has been authorized by the SSCL/EAO as a needed study to define SSCL policy and design approach for Spoils Management/Visual Landscape Enhancement for the E and F Service Sites, Experimental Hall sites, and the east and west campus sites. The study is an environmentally based approach that assures minimal environmental impacts and identifies appropriate mitigation.

A draft report—issued October 20, 1989 and included as Volume II of the SEIS Data Requirements submitted to Argonne National Laboratory (ANL) on October 25, 1989 by the SSCL/EAO—contained 27 graphics that were still incomplete. In December, 21 of these incomplete graphics were finished. The remaining six are scheduled for completion in January. Additional refinement and checking of the ANL October 25, 1989 submittal was also accomplished in December.

SEIS Ecological Data, Infrastructure Data, Construction Planning

These elements respond to ANL's requirement that the SSCL be responsible for: 1) assembling all available ecological base data on the SSC site area with respect to certain endangered plant or animal species; 2) data on the location and environmental consequence of all off-site infrastructure elements that are required to provide needed services to the SSC; and 3) details of the SSC construction process and schedule as a means of evaluating potential air, noise, or other environmental impacts during construction.

- No CCD activity occurred on these tasks during December.

PROJECT MANAGEMENT AND SUPPORT

(WBS 3.0)

PROJECT MANAGEMENT (WBS 3.1)

• PROJECT MANAGEMENT OFFICE (3.1.1)

During the month of December there were several major reviews in preparation for the January 9-11, 1990 Baseline review. On December 4 and 5 there was a machine design review. On December 6 there was a review of the baseline parameters and summary cost by DOE and there was a detailed review of the cost estimate on December 7 and 8. Also, on December 7 and 8, there was a business review and introduction by DOE/CH. On December 1 a joint meeting with SSCL, DOE/CH, TNRLC, Texas Department of Highways, Texas Utility, and Lone Star Gas was held to review the remaining input requirements for the Supplemental Environmental Impact Statement. In addition several coordination meetings were held to facilitate the scheduling of activities on the geotechnical program. Timely completion of the environmental checklist is required by DOE/CH. On December 12, there was a visit to Secretary Watkins by the SSCL and OSSC to review the status of the site specific design and cost estimate. On December 20, there was a review of the Magnet Collider Dipole System Acquisition Plan at DOE/HQ. Several project office personnel participated in the development of this plan and this review.

During the month of December interim milestones 44 and 45 were completed with the issuance of the draft Configuration Management Plan and draft Document Control Procedure. Also issued during the month were the final draft of the Site Specific Conceptual Design Report and Revision 5 of the Project Management Plan. The latter is intended for distribution during the January 9-11 review. The short list of AE/CM vendors was prepared early in December.

The document control criteria were developed in draft form and released December 1. The interim document indexing scheme and coding procedures were finalized and the implementation system is scheduled to start January 2, 1990. The final procedures for document control were reviewed with the Engineering Standards Committee and released December 12. For the document coding scheme initially an IBM PC-AT will be used until a database management program for the DEC is received. The AT database will transfer directly to the DEC.

• PMRS DEVELOPMENT (3.1.2)

A summary PMRS System flow model was completed and reviewed. The second draft of the Cost Account Manager's Handbook was written and reviewed. A simplified version with emphasis on planning, monitoring, and reporting at SSCL is now being reviewed. An EASYTRAK Operating Plan was completed defining the complete configuration of SSCL files including the relationships to other files. The Accelerator System WBS was revised to show the test beams as a separate Level 3 element.

- **PMRS DEVELOPMENT (3.1.2) - Continued**

An SSCL Schedule Development Plan was issued and reviewed. Because of this plan and the work that followed, the first cut of the SSC critical path schedule was issued on the 15th and finalized with milestones for incorporation into the Project Management Plan by the end of the month. Additional scheduling work included development of subnetworks for the collider technical components, magnets, and conventional construction. Additionally, a decision was made to proceed with the War Room preparation utilizing the room currently used for computer training.

- **QA MANAGEMENT SYSTEM (3.1.3)**

No activity for the month of December. However, during the month of January we anticipate making an offer to the QA officer and having activity in this element starting with the February report.

- **CONSTRUCTION CONFIGURATION MGMT. SYSTEM (3.1.4)**

A meeting was held at the Forrestal Building (DOE/HQ) to brief OSSC and CH personnel on the report and findings of the Working Group on Collider Tunnel Egress Spacing (SSC-SR-1042). There were personnel from CEBAF also in attendance at this meeting. During December there was also a two day meeting with the Underground Technology Advisory Panel (UTAP) focusing on the current geotechnical program plans for an instrumented test shaft for in site measurements in the Eagle Ford Shale, and plans for design and construction of the first tunnel segment. RTK is working on support to the Physics Research Division for detector modeling, and support to the Accelerator Division for injection lines and utility straight sections. Studies continued on the shafts at the F areas with regard to size and ventilation requirements.

Additionally, during December work continued on the editing of the Site Specific Conceptual Design Report and Baseline Cost Estimate. Specific cost estimating work centered on campus buildings and infrastructure.

- **COST ESTIMATING (3.1.5)**

For the DOE Cost Review on December 7-8, the Site Specific Conceptual Design Report cost estimate details were completed. The recommended 20 TeV design, a 17 TeV design, and a \$5.9B (<15 TeV) case were analyzed parametrically. By the end of the month details were developed for the recommended 20 TeV design. These details, a contingency analysis, project schedule, and WBS dictionary will be finalized and distributed for the DOE January 9-11 Review.

Additionally, during December a detailed estimate was made by Fermi Laboratory for the HEB magnet system. The Fermi estimate is based on the 7cm design discussed in the Site Specific Conceptual Design Report. When this is scaled to the 5cm recommended for the 20 TeV design and the number of prototype magnets are equal, their estimate agrees within a few percent of the independent estimate by the SSCL Magnet Group.

- **SYSTEMS ENG. & INTEG . (WBS 3.2)**

- **SYSTEMS ENGINEERING MANAGEMENT (3.2.1)**

Systems Engineering Management has worked with PMRS (3.1.2) to develop the low level network critical path schedule. The details of this schedule are generated at WBS level 5 and below and summarized upward for the overall project schedule and control milestones. Also the draft System Engineering Management Plan was completed and released for internal review. This plan is the first estimate for the number of people and resources required.

Additionally, the second draft Configuration Management Plan was released. This version incorporates the suggested changes by Project Management. Work was also started on developing the engineering standards and practices for the SSC Laboratory.

- **SE SUPPORT TO ASD (3.2.2)**

Work continued and was completed on the system hierarchy. This hierarchy will be used within the Accelerator Division to develop a specification tree at WBS level 6 and above, specifications, and interface control documents. Work also continued on rewriting the accelerator controls section of the Site Specific Conceptual Design Report.

- **SE SUPPORT TO MSD (3.2.3)**

Systems Engineering is taking the lead in vendor qualification, selection and project control requirements. In this process the first draft of the standard collider dipole specification was reviewed. Studies are currently underway to determine changes necessary for changes in the magnet aperture and assessment of the field quality errors associated with aperture size.

- **SE SUPPORT TO PHYSICS (3.2.4)**

No activity for the month of December.

PROJECT ADMINISTRATION AND SUPPORT

(WBS 3.3)

- **ADMINISTRATION SYSTEMS & SUPPORT (WBS 3.3.1)**

Progress was made in negotiations with DOE regarding our requested Appendix B changes to relocation allowances. However, our requested shortening of the waiting period for pension contributions is being held by DOE pending review by consulting actuaries.

Financial reports for the month of November were issued in a re-designed format which met with general acceptance in the lab. We began work on a financial systems review which has been spurred on by Deltek system deficiencies.

- **ACCOUNTING AND FINANCE (3.3.2)**

The Financial Systems Integrations office began work with General Computing to review the systems in place and begin the formal systems plan to document SSCL's present and future requirements. The delay in the pay cycle of Accounts Payable was reviewed and expected short term benefits in early January. The procedures for Travel Accounting were developed and documented.

The Accounting Operations office processed 50% more vouchers in December than in November (an increase from 1200 to 1800). The calendar year was closed in Deltek with the employees' tax reporting information properly compiled for issuance of W-2s. Relocation withholdings were successfully included in the data. Vendor tax reporting is being audited for issuance of 1099s. A physical count of the inventory in the storeroom was performed as of December 31, 1989.

The Budget office revised and spread, by month, the FY90 organizational budgets to reflect the November 20th funds distribution levels. The reformatted Job Status Summary Report was published, consolidating budget, cost, purchase order commitments, and purchase requisition information on one page for use in laboratory organizational cost and obligation control and budget iterations.

- **PROCUREMENT (3.3.3)**

During the month of December the Procurement and Contracting Department made awards totaling \$2,609,262 of which \$767,897 were to small disadvantaged businesses as defined in PL101-101 Section 301(a).

Contract provisions/clauses draft packages were completed as six pamphlets to cover all types of contracts expected to be issued by the SSCL. These documents will be submitted to the DOE contracting officer upon completion of internal legal review. Eighty percent of the standard practices necessary for operation of the department have been drafted and are pending implementation upon receipt of approval of the SSCL Procurement Policy document submitted to DOE-CH on September 1, 1989.

The A&E/CM RFP was issued to the short-listed competitors with responses due on January 12, 1989.

PROJECT ADMINISTRATION AND SUPPORT

(WBS 3.3)

• PROCUREMENT (3.3.3) - continued

Acquisition strategy briefing on the collider dipole magnets-phase II procurement was prepared and presented to the DOE Senior Review Panel at DOE headquarters on December 20, 1989. Direction was given on the strategy to be incorporated into the RFP to be delivered to DOE on February 1, 1989.

The Procurement and Contracting Department operating concept was reviewed with the objective of providing closer support to the major project operating groups. The management decision was made to decentralize and collocate dedicated procurement groups with the Magnet Systems Division and Conventional Construction Division. This will provide better communication and response time to the Associate Directors responsible for these activities. It will increase procurement manpower requirements by a minimum of six senior and mid-level subcontract administrators and buyers.

Procurement operations have been handicapped by the ineffective procurement module of the DELTEK financial information software package implemented by the laboratory. The result has been to overlay an automated system on top of a manual system resulting in excessive manpower process for management or requestors. Procurement has been working with Accounting and General Computing to find a solution to the problem. General Computing has hired a systems analyst who will be available the first of January to coordinate the development of a laboratory needs statement and requirements document to enable development of a permanent fix to the problem.

The Procurement and Contracting Department has participated in one outreach program during the month focusing on how to do business with the laboratory and what businesses may expect in terms of the type, amount, and schedule for goods and services to be procured by the SSCL. This program was presented in coordination with Congressman Joe Barton's office in Waxahachie for the Trade Union.

The FY90 Small and Small Disadvantaged Business Plan was submitted to DOE-SSC for approval and incorporation into the prime contract on 15 December 1989.

• TRAVEL DEPARTMENT (3.3.4)

During the month of December the Travel Services Department began development of a travel manual which will include policies, procedures and negotiated rates for all SSC travelers. Negotiations have continued with airlines, hotel chains, and car rental agencies to assure the best price for the laboratory along with good service and comfort for the traveler. These negotiated rates are made available to all people traveling for the SSC Laboratory.

• PERSONNEL (3.3.5)

The Personnel Department continued its high level of recruitment activity in December with 33 job offers accepted and the hiring of 22 new employees laboratory-wide.

PROJECT ADMINISTRATION AND SUPPORT

(WBS 3.3)

PERSONNEL (3.3.5) - continued

Major activities for December included final revisions of the Policy and Procedures Manual which is to be distributed for review and approval by the Associate Directors the week of January 15th. The Personnel Department co-sponsored the successful SSCL Health Fair held on December 13th. The Benefits Unit is currently exploring enhancements to the basic insurance plan for URA employees and is discussing the impact of possible changes with the insurance carriers, Fermilab and URA. Work has begun on establishing an Employee Recreation Association. We expect its first organizational meeting to be held in late January.

We have made major progress on refining regular reporting systems for all personnel transactions. Weekly reports will be sent to SSCL Divisions beginning in mid-January.

The laboratory received final approval for joining the Argonne Credit Union. Representatives from the credit union will be at SSCL during the week of January 22nd to work out operational details with Personnel, Finance and various State of Texas representatives.

The Personnel Department submitted proposed changes to the Appendix B (Personnel Appendix) relating to relocation benefits and increases to the employee morale fund. In-depth discussions are to be held with DOE in early January with final agreement and implementation expected by mid-January.

STAFF SUPPORT SERVICES (3.3.6)

During the month of December most of the efforts of the department were concentrated on three areas: acquisition of furniture and fixtures from the DOE site in Amarillo, Texas; development of a medical office for the laboratory; and, enhancements to our security system.

MINORITY AFFAIRS (3.3.7)

The EEO Manager selection was made in December and initial meetings were held with key SSC personnel to review placement practices and future personnel related issues. Meetings with SSC subcontractors' EEO personnel also were held and a schedule of EEO/AAP training sessions has been prepared for implementation laboratory wide. In a related activity, the Director of Minority Affairs met with the District Director of the Department of Labor's Office of Federal Contract Compliance Program to present the SSC Laboratory's Affirmative Action Plan and to obtain and distribute to SSC personnel appropriate EEO/AAP materials.

An extensive outreach effort to the small disadvantaged business and women owned business community, in coordination with the SSC Office of External Affairs and the SSC Procurement Office continues to be pursued and implemented. Keynote presentations during the month included the Dallas Park Central Rotary Club, participation in Minority Chamber activities in Dallas and Fort Worth, presentations on minority TV and printed media programs, vendor seminar follow-ups and respective registration process, participation in the Waxahachie labor leaders meeting hosted by U.S. Congressman Joe Barton, as well as SSC representation at

PROJECT ADMINISTRATION AND SUPPORT

(WBS 3.3)

- **MINORITY AFFAIRS (3.3.7) - continued**

social programs hosted by the area's Best Southwest Chamber of Commerce and the Dallas Center for Community Cooperation. In addition, a large number of DBE/WBE entries continue to visit the office for review of SSC procurement policies and appropriate referral to Procurement Office personnel.

The SSC Laboratory DBE Subcontracting Plan was completed and submitted to the Department of Energy in Washington. The Director of Minority Affairs has been designated as the person who will administer the plan for the laboratory. Prior to the completion, the Director along with the Director and Deputy Director of Procurement met with DOE/SSC representatives from Washington and Dallas to review the procurement potential.

Plans for the complete staffing of the Office of Minority Affairs will be completed next month and will enable the office to address issues with additional resources. No significant problems were encountered during the month.

PROJECT TECH SUPPORT (WBS 3.4)

• TECHNICAL SUPPORT MANAGEMENT (3.4.1)

Laboratory Technical Services management initiated studies to determine detailed requirements for Management Information Systems, particularly integration and compatibility of proposed systems for the Divisions that have interactive elements, eg; Property Management, Accounting, and Procurement.

Facilities engineering design was completed for the new Magnet inspection facility. Studies were initiated on various options for laboratory and office space to accommodate new staff and activities after the June-August 1990 time frame when the present facilities use will reach saturation.

Property management procedures and the bar code system were reviewed. An independent operational audit reported excellent progress and approved of the methodology.

• FACILITIES ENGINEERING SERVICES (3.4.2)

All facility modifications and associated moves were successfully completed as planned.

All divisions are now in their designated locations within the Interim Campus facilities.

Action continues on leasing: 1) the remaining 9,100 square feet of the third floor of the Provident Bank Building (formerly the DeSoto State Bank building) for the DOE On-Site Project Office and the expanding procurement function, 2) an additional 5,600 square feet in Stoneridge Building No. 2 for a Magnet workshop, and 3) additional land immediately adjacent to Stoneridge Building No. 4 for parking. Attention is now being focused on day-to-day operation and maintenance of facilities, re-evaluation of the physical aspects of safety and security systems and procedures, and providing continuing support for the dynamic growth of the interim facilities as well as the planning of the permanent Campus.

• PROPERTY MANAGEMENT (3.4.3)

With the arrival of Carl Williamson in early December we began the task of finalizing the Property Management procedures. It is estimated the original set of documents will consist of 15 to 18 separate procedures. The drafts of these procedures are scheduled for completion in February. The first 2 procedures are in rough draft form and are ready for review.

Property Management inventory control personnel have completed an inventory of all capital and sensitive property at the SSC Lab with the exception of Building 1, which is scheduled for completion on 15 January 1990.

PROJECT TECH SUPPORT (WBS 3.4)

(Continued)

- **FABRICATION SHOPS (3.4.4)**

A concentrated effort continues to place the manager of this area by January 1990. No other action was planned during this period.

- **GENERAL COMPUTING (3.4.5)**

MIS SOFTWARE SUPPORT

The time sheet generator programs to create the data for the forms are near completion. Once they are complete, a batch procedure will be created for Payroll to use when running the program.

A cross-reference listing of purchase requisitions with purchase orders will be generated by extracting the data and having a program combine the files.

The EG&G Savings Plan tape transfer procedure and the ACH Direct Deposit for URA employees is also complete except for training URA Payroll personnel.

A meeting was held with Sybase to review integrated software tools that enhance computer user productivity by integrating data management, applications development, and information exchange.

A study was commissioned to investigate delays in payments to vendors, identify the reasons and suggest solutions. A Yordin system diagram with backup documentation was developed to capture the As Is system and the serious problem areas were identified.

In response to the finding that charges for LBL Computing resources have been exceeding the budget allocated for such services, a listing of the accounts was brought over and a spreadsheet written to compile monthly trends. It has been determined that affected accounts will either be deleted, transferred to SSC Computing resources or have the billing changed from the SSC.

TECHNICAL SUPPORT

A formal study to develop the long range strategy for administrative MIS at the SSC has been initiated. A General Computing committee reviewed existing administrative applications; Human Resources, Property Management, Procurement, Payroll, Finance and Project Management.

The CAD/CAE requirements for FY90 and beyond were outlined in a report which resulted in the proposal for two Intergraph workstations. Accelerator and Physics Research Division mechanical applications requirements will be included in a CAD/CAE specification under development for the purposes of acquiring a standard CAD/CAE system for the laboratory.

A meeting was held with DOE/Chicago to review our ADP computing needs and clarify guidelines for the acquisition justification for computing equipment, security and telecommunications.

PROJECT TECH SUPPORT (WBS 3.4)

(Continued)

TECHNICAL SUPPORT - continued

Draft copies of the SSC Strategic and FY90 Short-Range plans have been prepared. They are designed to outline information which will be gathered from designated planning committees. Short term requirements covering the next two years report will be available in January, 1990.

USER SERVICES

The following user services activities are highlighted as part of the overall effort conducted to support computing and communications resources laboratory-wide:

- o Procedures for a laboratory-wide name service centralized under LTS direction were released.
- o Hardware and software for implementation of the Local Area Network for Directorate has been received and is undergoing acceptance testing. These components will be installed next month.
- o Equipment slated to support the HEPAP and DOE reviews, two major meetings to be held in January at the SSC, has been installed. These items include 20 VT-240 terminals and four MacIntosh personal computers with two Apple laserwriters to provide word processing capabilities.
- o A software bridge (SMTP Gateway) will support QuickMail for LTS in January, 1990.
- o Macintosh support for EasyLink can transfer files via telex to areas not served by Internet.
- o CMZ, a management system for FORTRAN 77 source code, has been released on SSCVX1.
- o Output is available from supported devices from a single executable image using an option file.

Development of the training area has been delayed by a change in the possession of Room 4-E330 which will be converted for use as the Project Management Review Room. The existing computer demonstration area, Room 4-E326, will be modified to accommodate the lost training area and the software lending library and evaluation hardware will be moved. Formal training on various MAC utilities is scheduled to begin in the classroom in February, 1990.

• DESIGN SUPPORT (3.4.6)

Meetings were held this month with representatives of two firms that specialize in providing CAE/CADD temporary technical personnel and other services. One firm provides technical expertise to solve computing and operational problems and the other also provides this service along with outside CAE/CADD support using their equipment and personnel or using their equipment and "our" personnel.

PROJECT TECH SUPPORT (WBS 3.4)

(Continued)

• **DESIGN SUPPORT (3.4.6) - continued**

Engineering Design Support provided design and drafting and plotting services support to the Accelerator Division, Facilities Coordination group, and the Document Control Standards committee this month.

Acquisition of the CAE/CADD hardware and software continues as a priority item. Evaluation of Intergraph and Unigraphics software has been underway since September. A product demonstration of AutoCAD on a Sun Sparcstation was presented during November. Its operational capabilities were very impressive.

• **COMMUNICATIONS (3.4.7)**

TELEPHONE SYSTEMS

All long distance services has been moved over to MCI and we have appropriately modified our line routing tables.

VIDEO/AUDIO SYSTEMS

Several contacts have been made with DOE regarding the establishment of video teleconferencing. A proposal was made to establish a system once we have established an understanding of our goals with DOE.

A TV antenna has been installed for Lab use to distribute special events to TVs on our campus. A design for our basic bi-directional CATV system was developed this month and all of the basic equipment was ordered.

RADIO COMMUNICATIONS

A formal request has been submitted with DOE for frequencies for a paging system. A tentative frequency allocation has been granted and a system acquisition proposal will be written as soon as formal permission has been granted. A request for radio trunking frequencies has been submitted from DOE-CH to DOE-HQ per our requirements for dispatching and other communications.

• **ENGINEERING SUPPORT/STANDARDS (3.4.8)**

Design tasks for the Spool Piece group pointed towards component design during the month. In order for the designs of the various components in the spool to progress, specific information is needed. The cryo/vac lab in Bldg. 4 will be the area used to accomplish the testing of selected components and proposed tests are being developed to use this facility and help define the equipment necessary for this laboratory. Andy Scheidemantle is proposing a test to evaluate a valve for the recoolers and Randy McConeghy is proposing a test to establish the parameters and characteristics of the signal cables selected for the Beam Position Monitor.

PROJECT TECH SUPPORT (WBS 3.4)

(Continued)

• **ENGINEERING SUPPORT/STANDARDS (3.4.8) - Continued**

Definition was developed by Don Clark on about \$89,000 worth of vacuum hardware needed to support the vacuum/cryo laboratory. This hardware includes a mass spectrometer leak detector, quadrupole gas analyzer, mobile pump cart and vacuum process controllers with appropriate gages.

A trip was taken by Randy McConeghy to American Magnetics Inc., Oak Ridge, TN to discuss a design of high current power leads. AMI is proposing a joint R & D program with the University of Wisconsin to develop a power lead meeting SSCL requirements. This proposal is being reviewed and a dialog with AMI will be established to determine if such an agreement will be beneficial to SSCL.

Randy and Don Clark also visited Whittaker ERI to discuss SiO₂ dielectric coaxial cable for use with the beam position monitor. This cable must be helium leak tight at all temperatures in order to be usable in the spool design. Test samples will be obtained and tested in the cryogenic environment here at SSCL.

Andy Scheidmante attended a week long seminar at Algor in Pittsburgh. Analysis techniques which are directly applicable to spool piece design were reviewed.

Design is continuing at EG&G AVO, Pleasanton, CA. They are doing layouts of the vacuum barrier, and cold mass support posts and the routing of the cryogenics piping in that zone.

Cost analysis reviews of the various spool pieces were completed and the addition of the mid cell corrector spools added to the cost. This cost was based on the concept that the corrector element will be mounted on the return end of a standard dipole magnet. Support and alignment of the corrector will be provided by the support hardware contained inside the cold mass envelope. The interconnect hardware will be extended to accommodate the corrector element.

Two Design positions and one Mechanical Engineer position requisitions were approved during the month and recruiting is proceeding to fill these positions. These positions will replace the support from EG&G AVO which will be terminated when the existing work order is complete by the end of February. CAD workstations for the two designers should be available the early part of next year.

• **METROLOGY LABS (3.4.9)**

No activity planned this month.

SSC LAB DIRECTORS OFFICE (WBS 3.5)

An Ad Hoc Committee on SSC Physics met on November 30 - December 1 at the SSCL to advise the Director on the impact of variations in the SSC energy and luminosity on the physics program. Their report (SSC-250) recommends that the SSC should aim for the largest machine allowed by the available resources, commenting that "there are no indications that would point toward a lower energy" while "the lack of significant deviations from the Standard Model... and our ignorance about electroweak symmetry breaking both argue for exploring as large an energy range as possible." Planning for SSC experiments should take into account the possibility of higher luminosities.

The Machine Advisory Committee met on December 4-5 at the SSCL and recommended that the 4 centimeter magnet aperture (inner diameter of the collider magnet coil) "represents a significant risk...and should be increased to 5 cm." They further recommended that the collider injection energy be increased up to 2 TeV and strongly supported the proposed reduction in half cell length from 114 to 90 meters.

The SSC Citizens' Advisory Committee met on December 5 at the SSCL and were briefed by members of the Directorate on the status of the project, the laboratory's education program and current statistics on new employees relocating to the area. The primary focus of discussion was on improving communications between the people of Ellis County and the laboratory.

The Scientific Policy Committee met on December 15-16 and discussed mainly the project scope. The Committee unanimously recommended that the energy be held at 20 TeV, particularly for the clarification of electroweak symmetry breaking, a very important discovery that "can be uniquely expected with confidence at a 20 TeV machine." The Committee also recommended that ample contingency be included in the cost estimate, and that a fixed number of dollars be maintained in the budget for funding the experimental program. They were enthusiastic about the generic detector R&D program and suggested it be continued under DOE management. Also discussed were magnets, foreign collaboration (which awaits the formulation of a clear DOE policy), the management of large collaborations and the schedule for proposals.

R&D AND PRE-OPERATIONS (WBS 4.0)

Accelerator Pre-Ops (4.1)

No activity for this report.

Research and Development (4.2)

Accelerator R&D (4.2.1)

- **Management Services (4.2.1.1)**

The details of the technical component SSC cost estimates have entered into the D-base III+ program input data file. The current cost estimate of the collider rings and injectors minus the superconducting magnets is around \$975M. There will be small additions and corrections to the database during the next several months as our knowledge improves.

The Accelerator Division staff on board has increased from 80 to 82 during December.

Our contribution to the final draft of the SCDR document is complete.

- **LINAC (4.2.1.2)**

The bottom-up cost estimate for the LINAC was completed with substantial help from Los Alamos and Fermilab. At TAC the commissioning of the magnetron source has started and the construction of the helical electrostatic quadrupole LEBT was completed.

- **LEB (4.2.1.3)**

Injection into the LEB has been studied more thoroughly in large-scale simulations, including the effect of space charge. Preliminary results indicate that the bunching factor is smaller by 10% relative to previous results, with a corresponding decrease of the time shift. However, a higher voltage may be needed in order to retain a high capture efficiency.

- **MEB (4.2.1.4)**

MEB work concentrated on writing for the Site-Specific Conceptual Design Report and cost estimating, with continued support from FNAL. The work included the various beam transfer systems and beam abort system as well as the components found in the MEB tunnel.

- **HEB (4.2.1.5)**

Cost estimates for the HEB were reviewed and modified in preparation for the upcoming DOE review in January. Several modifications to the HEB lattice were examined. These included an examination of the abort channel and its ability to cleanly abort the entire aperture, and

R&D AND PRE-OPERATIONS (WBS 4.0)

- **HEB (4.2.1.5) - continued**

possible changes to the lattice design related to slow extraction. A detailed tracking study of the resonant-extraction process was begun. This study will compare the extraction efficiency for different dipole apertures.

- **COLLIDER (4.2.1.6)**

Preparation and editing of material for the SCDR was completed. Substantial effort went into review and correction of costs in preparation for the January DOE review. Tracking studies were extended to the six million turn level, with the aid of a temporary increase in computer time allocations at the MFE center.

MAGNET R&D (WBS 4.2.2)

FERMI LAB (4.2.2.1)

Magnet DD0019 was cooled down for the fourth time with an end to end temperature difference of about 300K. Significantly more retraining occurred than had occurred following previous thermal cycles where the temperature difference was restricted to 125K. Although magnetic measurements were made with DD0019 and DD0026 warm, the mole failed before a cold measurement could be made. The warm magnetic measurements as well as cold NMR measurements on DD0017 and DD0019 yielded some interesting results.

Magnet DD0027 has arrived from BNL and awaits an opportunity to be tested in MTF.

Shake down of the long tooling continued with the successful winding and curing of the first practice outer coil. Additional skin welding tests were made on the skinning/yoking press including a test weld on an existing full length cold mass.

Dipole Cryostat

Work is continuing on the Heat Leak Test Facility in preparation for 80K to 4.5K MLI measurements.

R. Viola from the SSCL spent a week at FNAL working on the reduction of data taken during the shipping of DD0018 to Brookhaven.

A purchase requisition has been written and approved for the purchase of laser alignment equipment for use in cryostat and tooling assembly, setup, and adjustment.

We are beginning a development program with a composite tube vendors study the feasibility of redesigning the support posts with wound-in ends as opposed to shrink fit joints. We are also developing a composite material with increased shear modulus as a means of increasing the lateral support stiffness. This work will likely result in a procurement of prototype development pieces and/or assemblies. A formal proposal was sent to the SSCL by the vendor late in December for prototype support post development using the wound-in end technique.

Magnet DD0027 was successfully shipped from Brookhaven to FNAL. We shipped two completed vacuum vessels to BNL and brought DD0027 back on the same truck.

We completed a cost estimate on a typical SSC dipole prototype cryostat and forwarded it to the DOE (as requested by the DOE).

We are taking another look at the bore tube shuttle previously developed at FNAL. The current device tends to corkscrew down the pipe. The current work is aimed at eliminating this effect and at reducing the size for use with the warm bore.

Magnetic Measurements

Cold testing of magnets DD0019 was carried out at FNAL during this period. Results are reported under WBS section 1.2.6.

FERMI LAB (4.2.2.1) - continued

Long Magnet Fabrication

Cryostat Area

Magnet DD0027 arrived from BNL on 12/14/89 and is scheduled to be tested by MTF early next year.

Two surveyed and leak checked vendor vacuum vessels were sent to magnet storage on 12/11/89.

Collaring Press

The upper mold and mounting plate are ready to be mounted to the upper press beam - estimated to be completed about 1/10/90.

Yoke/Skinning Press

The main control unit for the automatic welder was returned to the vendor for adjustments. The unit has been received back and is now in operating condition.

Raised work platforms for the yoke skinning insertion table should be installed this week.

Winding Table

The outer winding mandrel sheathing was completed and installed onto the mandrel.

The first outer practice coil was wound, cured and measured. A second outer coil will be ready to be wound on about 1/3/90.

Winding of inner coils for the second practice Cold Mass will begin the week of 1/8/90.

Except for the heat exchanger operation, the entire curing process was automatically controlled by a computer program. Electrically operated valves for the heat exchanger will make for a fully automatic operation of this cycle.

The winding mandrel insertion, extraction and transport device was received and used in processing the first outer coil.

Key slots at the lead end of both the inner and outer curing molds were machined deeper to provide needed clearance for the preformed conductor ends.

The maintenance walk-ways for both the curing and collaring presses are complete.

FERMI LAB (4.2.2.1) - continued

F Series Model Program

Magnet F5 disassembly continues. The return end has been hipotted. Results are available. Potting and sectioning is now taking place.

Magnet DS0307 return end hipotting is complete. Results are available. Experiments with "square key" collaring methods using the DS0307 body will take place the week of January 8. Potting and sectioning of the DS0307 body will then take place.

DS0308 upper inner coil has been wound. Winding of the other coils for DS0308 will take place the first two weeks of January. DS0308 is expected to be ready for testing by the end of January.

Two strain gages have been successfully cold calibrated by the Materials Development Lab. The eight that are needed for DS0308 are expected to be completed the week of January 8.

Design on "grouped, developable surface" end parts for short SSC model outer coils is progressing. Drawings should be ready for manufacturing by mid-January.

Magnet Development

The 1.8m model DSS012 is to be used to measure directly the relation between sextupole moment and vertical diameter of the collared coil. The yoked and collared coil is to be compressed in the low-beta quadrupole yoking and skinning press and magnetic field measurements are to be made with the mole. In preparation for this experiment DSS012 was reassembled with horizontally split yoke laminations but the skin was not welded. At the point the measurements were to begin, the mole drive system failed. The mole was returned to Brookhaven for servicing and the measurements of DSS012 will resume in early January.

The 1m model F5 has been partially disassembled. The return end was cut off and turn-to-turn and turn-to-wedge hi-pots were performed. Turns were hi-potted successively to 100 V, 300 V and 500 V and then to breakdown. All turns passed the 500 V hi-pot and the lowest breakdown voltage was 1700 V. The return end of the 1m model DS0307 was assembled and then cut from the rest of the coil. A similar set of turn-to-turn hi-pots were done. One turn failed the 300 V hi-pot but the next lowest breakdown voltage was over 1200 V. The low breakdown voltage turn was on the first inner coil wound. This coil was used extensively over a period of several weeks to calibrate and cross-check the long coil size measurements. It was subjected to many compressions in the size measurement fixture and was probably subjected to some mishandling by inexperienced technicians. Just before the assembly of the magnet end a turn-to-turn short was found that had not been present immediately after curing. The short was not present, however, after the coil end was clamped and this point passed the 100 B hi-pot.

Tests of the integrity of insulation directly against collar laminations will be carried out by the Materials Development Lab by cyclically compressing small coil sections in a hydraulic press at both 300K and 80K. Samples will also be subjected to many thermal cycles to liquid nitrogen temperature. The fixtures required for these tests have been designed and are currently being constructed.

FERMI LAB (4.2.2.1) - continued

Magnet Development - continued

Cold and warm bore tubing were received from Brookhaven to be used for a new warm "finger" for magnetic measurements of model SSC magnets at Lab 2. (The existing SSC warm "finger" has too large an outer diameter to be able to accommodate magnets with voltage taps.) Most other parts needed for warm finger have been fabricated and the assembly is expected to be completed by late January. A G10 tube for a new measurements coil has been ground to a precise outer diameter.

BERKELEY LAB (WBS 4.2.2.2)

Superconducting and Cable

The proposed scale-up from 12" diameter billets to 14" diameter billets continues to look promising. In December, R. Remsbottom of the SSCL and R. Scanlan visited the Curtiss Wright facility in Buffalo, New York and discussed with them the projected extrusion requirements for the SSC project. They are very interested in the SSC project and we believe that they can become a second qualified source for 14" - 16" diameter extrusions.

In the area of cable R&D, we have designed and manufactured an alternative SSC inner layer cable for a 4-cm bore dipole. This cable has 28 strands of 0.65mm (.0255") diameter wire, with the same width as the present SSC inner cable, but a thickness which is determined by the strand diameter, i.e., the cable is thinner. This thinner cable will allow more turns in the inner layer, and the smaller diameter wire provides the wire manufacturer with a greater cold work range, which will provide higher J_c . In addition, the cable will be more flexible and hence easier to wind. The matching outer cable would have 36 strands of 0.528mm (0.0208") diameter wire which is nearly identical to the FNAL low beta quadrupole cable of which we have successfully manufactured more than 16,000 ft. More details of the cable design and its incorporation into an overall dipole cross section design are discussed in a report by C. Taylor, SC-MAG-270. An example design of an SSC dipole cross-section with this cable has been made by S. Caspi.

Cable Test Facility

The magnet D16B-1 has been assembled and is scheduled to be tested in early January, 1990. The assembly involved compressing iron yoke blocks around the coils and then slipping on aluminum shrink rings which were heated to 350 F. A relatively thin stainless steel shell (.125 inch thick) was welded over the rings to impart some torsional stiffness to the final assembly and to react the end load.

Quadrupole Magnets

Development of quadrupole magnets for the SSC Collider ring is being carried out at LBL.

QA-3, a third 1-m model quadrupole of the old QA design, was tested from December 8-15, 1989. The training behavior of QA-3 was markedly worse than that of QA-1 and QA-2. The initial quench current, at 4.3K, of QA-3 was 5631A which is about the same as the initial quench currents of QA-1 and QA-2. However, the training of QA-3 was very slow, with the quench current rising only to 6789A on the 26th quench. Both QA-1 and QA-2 exceeded this value by the 6th quench and exceeded 7200A by the 20th quench, their plateau values. All QA-3 quenches were in the pole turn and all but two were in the inner layer. There were several mechanical changes made between QA-2 and QA-3 and these are being studied as the possible causes of the strange magnet behavior.

Training at 1.8K was also very poor with the quench current only rising to 7405A after eleven quenches. All but one of these quenches were in the outer layer pole turn. Magnet QA-2 reached over 9200A at 1.8K.

BERKELEY LAB (WBS 4.2.2.2) - Continued

Quadrupole Magnets - continued

The magnetic field quality is quite good, as in QA-1 and QA-2. The ratio of the 12 pole and 20 pole fields to the quadrupole field were one unit or less.

Quadrupole QC

All preparations for winding coils for the new design, designated QC are complete and winding will start in early January. The collar die has been modified and collars that meet specification tolerances have been made.

Copper wedges were made for the QC-quadrupole. After several iterations in the die size and shape, we obtained dimensionally correct wedges.

Long Quadrupole Tooling

Orders have been placed for all long lead and/or larger components for the coil winding mandrels, molding cavities, molding press, and heating equipment for the 5-meter quadrupole coils. Design of the mandrel cavity lifting tool and the compression gage for coil size inspection is continuing at SSCL in Texas.

Cleaning and painting of Building 54, the location of the long quad facility, has begun. Reinforcement of the foundation for the main press has also begun.

- **SUPERCONDUCTING CABLE R&D (WBS 4.2.2.3)**

The expediting of existing wire orders has continued with quite favorable results. After several months of delays, a batch of 14 billets of almost identical design capable of demonstrating a 10% improvement in critical current are underway. The delays stemmed primarily on raw material availability. It is anticipated that the final extrusions for this material shall occur in early February for all vendors. All three vendors are either on schedule or ahead. If this trend continues, the conductor limitations recently experienced should be relieved. SSCL emphasis has shifted toward cabling of the available wire strand. During these next cabling runs set-up procedures have been put in place and are being verified. Inconsistencies have already been found in the dimensional measurement techniques which are being rectified. Other omissions will surely be discovered but it is hoped that a final, thoroughly debugged set of procedures, will be in place by mid year.

Conductor contracts for prototypes in FY91 remain on the critical path and all efforts are being made to avoid a repeat of this year where conductor availability paced prototype production. Orders for twenty 300 mm billets are in contracts pending appropriate approvals. RFQs for approximately 15 350mm billets are being prepared. As planned these billets are part of the scale-up program and, because development is intended, less than optimum yield is expected.

BROOKHAVEN LAB (WBS 4.2.2.4)

MODEL MAGNETS

Long Magnets

Interconnection assembly operations were completed on DD0020. Cryostat subassembly was followed by cryostat assembly operations. Warm measurements were performed.

Inner coils were wound and cured for DD0028, and their assembly completed. End gauging was performed. Yoke block fabrication began.

Installation operations continued on DDA010 in Bay B of the Horizontal Test Facility.

Inner coils were wound for DCO201, followed by their mutual assembly.

Sixty-five tons of 16-gauge magnet steel and six tons of 18-gauge steel have arrived from Inland Steel, thus completing the entire order. Material has been shipped to H & J for fabrication of yoke laminations for five short SSC dipoles and two long dipoles. All DD0028 yoke laminations have arrived, while other laminations await completion of the new die.

Short Magnets

Vertical tests were performed on DSS018 with good results. The Dipole was subsequently removed from the dewar. DSS019 was installed in the vertical dewar, and tests began in the third week of December.

DSV016, tested in October, was disassembled, re-shimmed, re-collared with reduced assembly shims and assembled; the shell was welded and the magnet once again mounted in the top hat in preparation for low prestress testing.

Beam Tubes and Trim Coils

A new contract to upgrade the Silvex plating facility was submitted and approved. Three beam tubes were plated by Silvex in December; all three tubes were rated flawless in all respects.

Three long beam tubes were wrapped for use by FNAL.

Correctors

Conceptual design work has started on corrector coil packages in close unison with SSCL personnel.

TOOLING AND EQUIPMENT

Coils

Engineering work continues on the problem of curing inner and outer DSS coils with all-Kapton insulation. After completion of heating tests on a refurbished 1.8-m outer coil formblock, the first all-Kapton outer coil was successfully wound and cured, heating it to 225°C in approximately one hour. Work has also been initiated on the investigation of coil tooling for dipoles of 50mm aperture.

BROOKHAVEN LAB (WBS 4.2.2.4) - Continued

Test Equipment

Calibration of mole DI has been completed. Work continues on mole DII, while awaiting repair on its encoder by the manufacturer. Work is progressing on the first mole transporter. Though changes in the tether drive have caused some delays, both mechanical and electrical work is on track. Many components have been ordered for moles III, and IV, as well as for two more transporters.

SUPERCONDUCTOR

Cable Procurement

This month outer cable lot SC23-0000, (totaling 11,800 ft.) was received from NEEWC. BNL is in the process of performing incoming inspection. The cable will be insulated and ready for coil winding in early January.

Tooling

The procedures for modifying BNL's wrapping line have been established and are being implemented. A schematic layout of the modified wrapping line was completed in December, and initial analysis of its power train commenced.

Miscellaneous

Fiberglass production samples were received from Hexcel, and inspection initiated. The low-epoxy material (20% epoxy content) has passed BNL's incoming inspection. Meanwhile, tests continue on the standard material (24% epoxy content).

TESTS AND MEASUREMENTS

The principal testing activity this month was the testing of DSS018, a magnet of standard construction. Its quench performance was excellent, requiring one initial training quench at 6.56 KA to reach the plateau at 6.8 KA. No additional training was needed in reaching quench-current plateaus at 3.85K (7.4 KA) and 3.35 K (7.9KA). There was no retraining after a thermal cycle. Multipole measurements included the usual set of data, and additional measurements taken during a simulated SSC operation cycle.

Warm measurements of the 17-m dipole DD0020 were taken before and after the cold mass was fixed to the posts of the cryostat. Of particular interest here was the dipole field angle.

- **MAGNET R&D PHYSICS (WBS 4.2.2.5)**

No report this month.

- **MISCELLANEOUS LABS AND UNIVERSITIES
(WBS 4.2.2.6)**

No report this month.

EXPERIMENTAL SYSTEMS (WBS 5.0)

- **EXPERIMENTAL SYSTEMS R&D (WBS 5.1)**

The process of writing the Memoranda of Understanding (MOU) between the SSC Laboratory and the collaborations that will receive funding in FY90 to perform R&D on major detector subsystems has been started. The review committee, which met in November to consider the proposals, recommended approval, or partial approval, of 14 projects. The MOU will specify the work to be performed by each institution in the collaboration and the funding level to be provided. In this regard, many of the collaborations sent representatives to the SSC to defend their proposed programs to the Laboratory staff. The hope is to have all of the MOU signed by the end of January.

LAB OPERATIONS SUPPORT (WBS 6.0)

PHYSICS PROGRAM SUPPORT (WBS 6.1)

• DIVISION OFFICE (6.1.1)

FY 90 Budget allocations were established based upon the Project Management Funding Plan of November 20. Budget inputs to both the Financial Accounting Department and the Project Management PMRS systems were prepared. A level of effort for each group was utilized based on the staffing plan for each group. It was established that the division will utilize equipment money for the procurement of all divisional PCs and this information was coordinated with Financial Accounting.

Initial paperwork was processed in preparation for four guest scientists who will serve three- to four-month terms at the Lab shortly after January 1st.

Cubicle construction, hardware and software installations continued as the division office prepares for the ramp-up in personnel staffing for FY90.

Support staff projections for the division office were reviewed in preparation for firm budgeting purposes.

Support staff job descriptions and responsibilities were reviewed and discussed with individual staff members.

In view of the busy meeting activity planned for the early part of the year, travel and meeting planning procedures for the division were reviewed with further discussions to be scheduled shortly.

Issues involving personnel operations, recruiting and division administration were addressed and resolved ensuring an effective paper flow and communication.

Division procedures for document storage and retrieval options were discussed.

• THEORY (6.1.2)

No activities are anticipated in this group until 1990.

• EXPERIMENTAL PHYSICS AND FACILITIES (6.1.3)

Efforts were begun at RTK to formulate a more complete conceptual design for the LSD detector hall. The introduction of large loads in the detector hall may sufficiently deform the floor that alignment of the detector will be difficult. This sets an upper limit on the size of objects that can be brought into the detector hall. Schedule and cost favor construction of as much of the detector at the surface as possible. In the L* approach, 600-ton assemblies may be loaded down into the detector hall. This may set severe requirements on the need for floor reinforcement. These studies will continue through the Spring.

The Site-Specific Conceptual Design Report (SCDR) for the experimental facilities was completed in December. A cost estimate for the design was also completed. Work was also done on putting together a schedule for the construction of experimental systems.

- **EXPERIMENTAL PHYSICS AND FACILITIES (6.1.3)-**
Continued

Larry Nodulman joined the division on a six-month leave-of-absence from Argonne National Laboratory.

- **COMPUTING AND DATA ANALYSIS (6.1.4)**

VAX SYSTEMS

A proposal to upgrade the existing VAX 6310-based SSCVX1 system to a VAX 6420 was reviewed and approved by DOE/Chicago. The upgrade is scheduled for January, 1990. Another proposal for additional Intergraph CAD/CAE workstations was also submitted for DOE review.

The DEL_WHO user routine has been written for the SSCAD1 to enable users to list all other interactive users with DELTEK files open and display the images being executed.

Support was provided to DELTEK users for the month-end closing. DELTEK data files consume a significant amount of the two RA90 disk drive space. The users have done their year-end closing procedures in DELTEK Version 3.1 and will probably move to Version 3.2 by mid-January.

Project management personnel have been moved to the SSCAD1 now that all administrative data processing is performed on SSCAD1. Users who were moved to the SSCVAX1 administrative system have retained their accounts on the open system for E-Mail purposes.

ETHERNIM Local Area Network Traffic Monitor and Remote Bridge Management software has been installed on SSCNET.

A Benchmark Working Group is developing a strategy for comparing the performance of various computer systems by obtaining and presenting coherent and traceable benchmark data. The committee will use an index to quantify computer system performance in areas that are meaningful to the SSC community. The committee will present its findings in January, 1990.

COMPUTING AND DATA ANALYSIS

A request for three SUN Sparcstation workstations totalling \$57K was submitted to DOE/Chicago. Documentation supporting this proposal was reviewed and approved, and the workstations will soon replace existing equipment which was on loan from other divisions.

The state of the CERN library software in the UNIX environment was reviewed and a CERN library reference documentation area has been completed.

UNIX workstation users can now print on SSC Apple laserwriters using CAPS software from LBL as the interface while the hardware interface requires a Kinetics fastpath.

• **COMPUTING AND DATA ANALYSIS (6.1.4) -
Continued**

NETWORK

Nominations have been proposed for representatives to the various SSC network committees.

The network resources for Appletalk and terminals have been reorganized to improve efficiency.

A detailed documentation of the Local Area Network has been initiated to clarify this resource.

• **LIBRARY SERVICES (6.1.5)**

During the month of December the library was approved by the AHE Board of Trustees as an Associate Participant in the Association for Higher Education of North Texas. This allows extensive interlibrary lending of books, journal articles, and microforms; daily courier service; access to library courtesy cards for the laboratory employees and access to the holdings information of all AHE libraries.

Training for the library staff on use of the recently acquired "Visual Search Microfilm Files System" was provided by The Information Handling Systems. The first training seminar for the Lab will be scheduled next month.

The preprints and conference area of the library has written to approximately 500 laboratories and institutions around the world to establish contacts to receive necessary preprints. The latest preprints from DESY, CERN, and Fermilab have been labeled and catalogued and are available on the circulation desk in the main library area. The preprints from 1987-1988 are also being catalogued and made available, as time permits.

The conference area of the Library has contacted principle people for each conference and posted the information outside the library. A list of conferences through September 1991 has been made available on the "give-away" shelf in the library.

An additional highlight during the month of December was the implementation of the on-line system for placing orders, cataloging materials and checking in serials.

• **TECHNICAL INFORMATION AND PUBLICATIONS (6.1.6)**

A manager of Graphic Services was hired and will start at the Lab on January 2, 1990. All major equipment purchases to support the services being provided to the laboratory has been procured.

A formal meeting was held with the local GPO office. April 1990 was set as a target date for implementing Direct Deal Contracts with local printers. Four local printers have been recommended to the GPO as printers for the Laboratory. Three of the recommended printers are minority owned. The Manager of Technical Information and Publications will be the primary contact between the GPO and the Laboratory. All requests for printing for the Laboratory will be handled through the Publications Group. They will work directly with the local printers to ensure that the material printed meets the standards of the laboratory and is completed in a timely and professional manner.

SAMPLE ONLY - NOT ACTUAL DATA

SUMMARY COST/SCHEDULE NARRATIVE

LEVEL 2 WBS

1.0 TECHNICAL SYSTEMS

ACCELERATOR SYSTEMS

MAGNET SYSTEMS

SAMPLE ONLY

2.0 CONVENTIONAL FACILITIES

3.0 MANAGEMENT AND SUPPORT

4.0 LAB OPERATIONS

5.0 EXPERIMENTAL SYSTEMS

MANAGEMENT CONDITION SUMMARY

<u>ACCELERATOR SYSTEMS</u>	<u>CUR/CUM COST</u>	<u>CUR/CUM SCHEDULE</u>
1.1.1 ACCEL. MGMT. & SUPPORT	G	G
1.1.2 LINAC	G	G
1.1.3 LEB	G	G
1.1.4 MEB	G	G
1.1.5 HEB	G	G
1.1.6 COLLIDER	G	G
1.1.7 TEST BEAMS	G	G

<u>MAGNET SYSTEMS</u>	<u>COST</u>	<u>SCHEDULE</u>
1.2.1 MANAGEMENT & SUPPORT	G	G
1.2.2 HEB MAGNETS	G	G
1.2.3 COLLIDER MAGNETS	G	G
1.2.4 MAGNET FAC. EQUIP/TOOLING	G	G

<u>CONVENTIONAL CONSTRUCTION</u>	<u>COST</u>	<u>SCHEDULE</u>
2.1.1 CAMPUS	G	G
2.1.2 INJECTOR	G	G
2.1.3 COLLIDER	G	G
<u>2.1.4</u> EXPERIMENTAL HALLS	G	G
2.2.1 CENTRAL LAB OFFICE	G	G
2.2.2 HEAVY WORKS BLDGS.	G	G
2.2.3 SHOPS	G	G
<u>2.2.4</u> SUPPORT BLDGS.	G	G
2.3.1 LINAC	G	G
2.3.2 LEB	G	G
2.3.3 MEB	G	G
2.3.4 HEB	G	G
2.3.5 TEST BEAM AREA	G	G

MANAGEMENT CONDITION SUMMARY

<u>CONVENTIONAL CONSTRUCTION</u>	<u>CUR/CUM COST</u>	<u>CUR/CUM SCHEDULE</u>
2.4.1	NORTH ARC	G
2.4.2	SOUTH ARC	G
2.4.3	WEST CLUSTER	G
<u>2.4.4</u>	EAST CLUSTER	G
2.5.1	WEST CLUSTER	G
<u>2.5.2</u>	EAST CLUSTER	G
2.6.1	MGMT/ADMIN/REPORTING	G
2.6.2	MAJOR STUDIES	G
2.6.3	DESIGN CRITERIA & REPORT	G
2.6.4	DESIGN OVERSIGHT	G
2.6.5	CONSTRUCTION OVERSIGHT	G
2.6.6	CONFIG. MGMT./INTERFACE CONT.	G
2.6.7	SPACE PLNG./DESIGN SUPPORT	G
2.6.8	GEOTECHNICAL PROGRAM	G
2.6.9	SURVEY PROGRAM	G
2.6.10	A/E-CM SEL/CONT SUPPORT	G
2.6.11	RESERVED	G
2.6.12	SEIS SUPPORT	G
2.6.13	MISC. RTK SUPPORT	G
2.7.1	ARCHITECT ENGR.	G
2.7.2	CONSTRUCTION MGMT.	G

<u>MANAGEMENT AND SUPPORT</u>	<u>COST</u>	<u>SCHEDULE</u>
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3.1.1	PROJECT MANAGEMENT OFFICE	G
3.1.2	PMRS	G
3.1.3	Q/A MANAGEMENT	G
3.1.4	CONFIGURATION MGMT.	G
<u>3.1.5</u>	COST ESTIMATING	G
3.2.1	SYSTEMS ENG. MGMT.	G
3.2.2	SE SUPPORT TO ASD	G
3.2.3	SE SUPPORT TO MSD	G
<u>3.2.4</u>	SE SUPPORT TO PHYSICS	G
3.3.1	ADMIN SYS. AND SUPPORT	G
3.3.2	ACCTG. AND FINANCE	G
3.3.3	PROCUREMENT & SUBCONTRACT	G

3.3.4	TRAVEL SERVICES	G	G
3.3.5	PERSONNEL	G	G

MANAGEMENT CONDITION SUMMARY

<u>MANAGEMENT AND SUPPORT</u>		CUR/CUM COST	CUR/CUM SCHEDULE
3.3.6	STAFF SUPPORT SERVICES	G	G
<u>3.3.7</u>	MINORITY AFFAIRS	G	G
3.4.1	TECH SUPPORT MANAGEMENT	G	G
3.4.2	FACILITIES ENG. SERVICES	G	G
3.4.3	PROPERTY MANAGEMENT	G	G
3.4.4	FABRICATION SHOPS	G	G
3.4.5	GENERAL COMPUTING	G	G
3.4.6	DESIGN SUPPORT	G	G
3.4.7	COMMUNICATIONS	G	G
3.4.8	ENG. SUPPORT/STANDARDS	G	G
<u>3.4.9</u>	METROLOGY LABS	G	G
3.5.1	DIRECTORATE	G	G
3.5.2	EXTERNAL AFFAIRS	G	G
3.5.3	LEGAL SERVICES	G	G
3.5.4	RESEARCH AND TECH ASSMT.	G	G
3.5.5	USERS OFFICE	G	G
3.5.6	ENVIRON. HEALTH & SAFETY	G	G
3.5.7	PLANNING	G	G
3.5.8	INTERNATIONAL COORDINATION	G	G
3.5.9	MANAGEMENT FEES	G	G
<hr/> <u>R&D AND PRE-OPERATIONS</u>		COST	SCHEDULE
4.2.1	ACCELERATOR R&D	G	G
4.2.2	MAGNET R&D	G	G
4.2.3	PHYSICS R&D	G	G
<hr/> <u>EXPERIMENTAL SYSTEMS</u>		COST	SCHEDULE
5.1.1	GENERIC R&D	G	G
5.1.2	MAJOR DETECT. & SUBSYSTEMS	G	G
<u>5.1.3</u>	APPROVED EXPERIMENTAL R&D	G	G
5.2.1	DETECTOR 1	G	G
5.2.2	DETECTOR 2	G	G
5.2.3	DETECTOR 3	G	G
5.2.4	DETECTOR 4	G	G
5.2.5	DETECTOR 5	G	G
5.2.6	DETECTOR 6	G	G

MANAGEMENT CONDITION SUMMARY

<u>LAB OPERATIONS SUPPORT</u>	CUR/CUM COST	CUR/CUM SCHEDULE
6.1.1 PHYSICS ADMIN/SUPPORT	G	G
6.1.2 PHYSICS THEORY	G	G
6.1.3 EXPER. PHYSICS & FACILITIES	G	G
6.1.4 COMPUTING & DATA ANALYSIS	G	G
6.1.5 PHYSICS LIBRARY SERVICES	G	G
<u>6.1.6</u> TECHNICAL INFO. & PUBS.	G	G
6.2.1 MANAGEMENT	G	G
6.2.2 ADMIN. SYSTEMS & SUPPORT	G	G
6.2.3 PROJECT TECH. SUPPORT	G	G

SAMPLE ONLY - NOT ACTUAL DATA

MANAGEMENT CONDITION ANALYSIS

DIVISION:	MAGNETS	VARIANCE		
		COST	SCHEDULE	
LEVEL 3 WBS:	HEB MAGNETS	CURRENT	(167)	(98)
		PRIOR 1 MO. (cum)	(1768)	(1433)
CURRENT ASSESSMENT:	COST: RED	PRIOR 2 MO. (cum)	(1555)	(1159)
	SCHEDULE: RED	PRIOR 3 MO. (cum)	(1266)	(798)

PROBLEM:

CAUSE/EFFECT:

CORRECTIVE ACTION:

CURRENT STATUS:

CONTACT/PHONE EXT.:

NOT ACTUAL DATA
SAMPLE ONLY

SAMPLE ONLY
NOT ACTUAL DATA

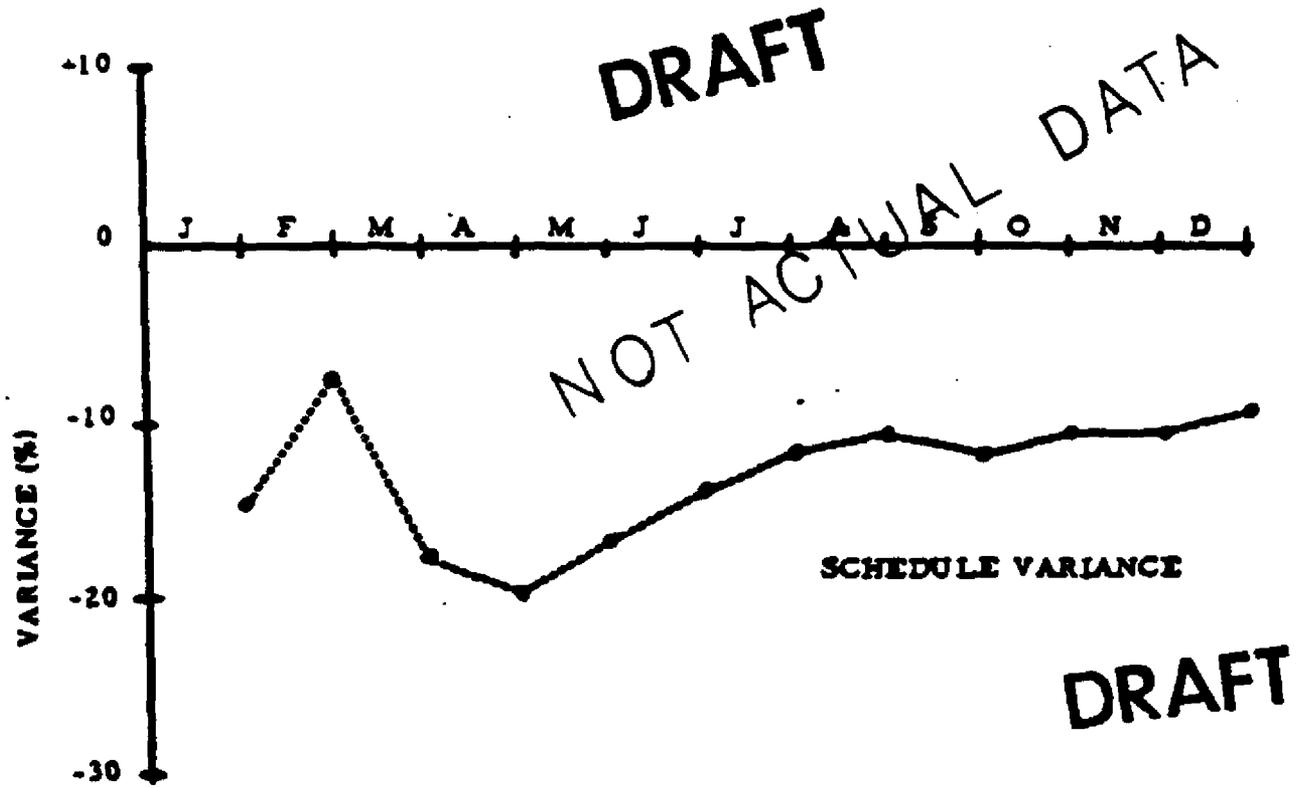
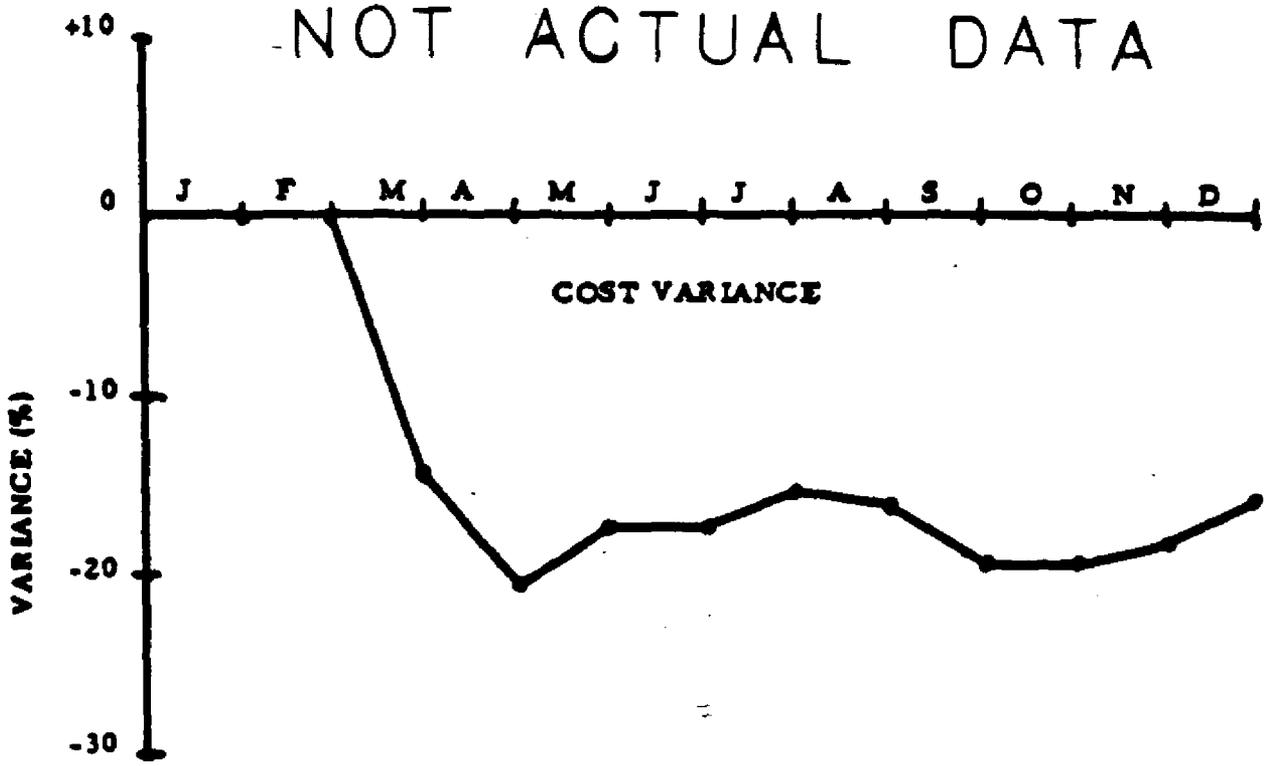


FIGURE VIII. 5
PERCENTAGE VARIANCE TREND CHARTS

SSC LABORATORY - CONTRACT #DEACO289ER40486 - FORMAT I (BY WBS)

COST PERFORMANCE REPORT - BY WBS													
REPORT PERIOD											\$ IN 000'S		
FROM: 11/26/89													
TO: 12/31/89													
WBS ITEM	CURRENT PERIOD					CUMULATIVE TO DATE					**FY90		
	BCWS	BCWP	ACWP	VARIANCE		BCWS	BCWP	ACWP	VARIANCE	BAC	LRE	VARIANCE	
				SCHEDULE	COST				SCHEDULE	COST			
1.0 TECHNICAL SYSTEMS	697	697	696	0	1	1,912	1,912	1,955	0	-43	56,684	56,684	0
2.0 CONVENTIONAL CONSTRUCTION	2,026	2,026	1,011	0	1,015	4,030	4,030	3,162	0	868	26,220	26,220	0
3.0 PROJECT MGMT. & SUPPORT	3,695	3,695	2,807	0	888	9,693	9,693	9,173	0	520	38,965	38,965	0
4.0 R&D AND PRE-OPERATIONS	5,213	5,213	5,180	0	33	10,869	10,869	10,756	0	113	54,278	54,278	0
5.0 EXPERIMENTAL SYSTEMS	0	0	40	0	-40	0	0	125	0	-125	10,443	10,443	0
6.0 LAB OPERATIONS SUPPORT	753	753	335	0	418	1,844	1,844	1,039	0	805	10,137	10,137	0
TOTAL DIRECT COSTS	12,384	12,384	10,069	0	2,315	28,348	28,348	26,210	0	2,138	196,727	196,727	0
MANAGEMENT RESERVE											87	87	
TOTAL	12,384	12,384	10,069	0	2,315	28,348	28,348	26,210	0	2,138	196,814	196,814	0

**BAC REFLECTS FY90 BUDGET ONLY PENDING BASELINE APPROVAL

SSC LABORATORY - CONTRACT #DEACO289ER40486 - FORMAT I (BY WBS)

COST PERFORMANCE REPORT - BY WBS												
REPORT PERIOD										\$ IN 000'S		
FROM: 11/26/89												
TO: 12/31/89												
CURRENT PERIOD					CUMULATIVE TO DATE					**FY90		
WBS ITEM	BCWS	BCWP	ACWP	VARIANCE	BCWS	BCWP	ACWP	VARIANCE	BAC	LRE	VARIANCE	
				SCHEDULE COST				SCHEDULE COST				
3.3.1 ADMIN SERVICES MGMT.	206	206	217	0 -11	619	619	641	0 -22	2,520	2,520	0	
3.3.2 ACCTG. & FINANCE	230	230	249	0 -19	464	464	428	0 36	1,842	1,842	0	
3.3.3 PROCUREMENT & S/CONT.	277	277	237	0 40	668	668	671	0 -3	2,688	2,688	0	
3.3.4 TRAVEL SERVICES	20	20	13	0 7	47	47	41	0 6	219	219	0	
3.3.5 PERSONNEL	248	248	201	0 47	543	543	446	0 97	2,152	2,152	0	
3.3.6 STAFF SUPPORT SERVICES	205	205	124	0 81	502	502	425	0 77	1,175	1,175	0	
3.3.7 MINORITY AFFAIRS	36	36	16	0 20	61	61	46	0 15	424	424	0	
TOTAL 3.3 PROJ. ADMIN. & SUPPORT	1,222	1,222	1,057	0 165	2,904	2,904	2,698	0 206	11,020	11,020	0	

**BAC REFLECTS FY90 BUDGET ONLY PENDING BASELINE APPROVAL

SSC LABORATORY - CONTRACT #DEACO289ER40486 - FORMAT I (BY WBS)

COST PERFORMANCE REPORT - BY WBS													
REPORT PERIOD										FROM: 11/26/89		\$ IN 000'S	
										TO: 12/31/89			
CURRENT PERIOD						CUMULATIVE TO DATE						**FY90	
WBS ITEM	BCWS	BCWP	ACWP	VARIANCE		BCWS	BCWP	ACWP	VARIANCE		BAC	LRE	VARIANCE
				SCHEDULE	COST				SCHEDULE	COST			
3.5.1 DIRECTORATE	323	323	309	0	14	941	941	919	0	22	3,841	3,841	0
3.5.2 EXTERNAL AFFAIRS	31	31	49	0	-18	84	84	138	0	-54	574	574	0
3.6.3 LEGAL SERVICES	32	32	52	0	-20	54	54	76	0	-22	300	300	0
3.5.4 RESEARCH & TECH. ASSMT.	13	13	0	0	13	13	13	1	0	12	100	100	0
3.6.5 USERS OFFICE	18	18	15	0	3	38	38	35	0	3	142	142	0
3.5.6 ENVIRON. HEALTH & SAFETY	46	46	51	0	-5	115	115	119	0	-4	422	422	0
3.5.7 PLANNING	27	27	29	0	-2	61	61	72	0	-11	250	250	0
3.5.8 INTERNAT'L. COORDINATION	15	15	0	0	15	15	15	0	0	15	151	151	0
TOTAL 3.5 PROJECT DIRECT. OFFICE	505	505	505	0	0	1,321	1,321	1,360	0	-39	5,780	5,780	0
TOTAL 3.0 PROJ. MGMT. & SUPPORT	3,695	3,695	2,807	0	888	9,693	9,693	9,173	0	520	38,965	38,965	0

**BAC REFLECTS FY90 BUDGET ONLY PENDING BASELINE APPROVAL

SSC LABORATORY - CONTRACT #DEACO289ER40486 - FORMAT 2 (BY OBS)

COST PERFORMANCE REPORT - BY OBS													
										REPORT PERIOD		FROM: 11/26/89	\$ IN 000'S
												TO: 12/31/89	
CURRENT PERIOD					CUMULATIVE TO DATE					**FY90			
	BCWS	BCWP	ACWP	VARIANCE		BCWS	BCWP	ACWP	VARIANCE	BAC	LRE	VARIANCE	
					SCHEDULE COST					SCHEDULE COST			
OBS ITEM													
D - DIRECTORATE	505	505	505	0	0	1,321	1,321	1,360	0	-39	5,780		
B - PROJECT MANAGEMENT	730	730	587	0	143	1,733	1,733	1,525	0	208	8,647		
A - ACCELERATOR SYSTEMS	1,025	1,025	992	0	33	2,865	2,865	2,811	0	54	24,560		
C - CONVENTIONAL CONSTRUCTION	2,026	2,026	1,011	0	1,015	4,030	4,030	3,162	0	868	26,220		
T - TECHNICAL SERVICES	1,238	1,238	657	0	581	3,735	3,735	3,590	0	145	13,520		
G - ADMINISTRATIVE SERVICES	1,222	1,222	1,057	0	165	2,904	2,904	2,698	0	206	11,020		
P - PHYSICS RESEARCH	753	753	375	0	378	1,844	1,844	1,164	0	680	20,580		
M - MAGNET SYSTEMS	4,885	4,885	4,885	0	0	9,916	9,916	9,900	0	16	86,400		
TOTAL SSC LABORATORY	12,384	12,384	10,069	0	2,315	28,348	28,348	26,210	0	2,138	196,727		

****BAC REFLECTS FY90 BUDGET ONLY PENDING BASELINE APPROVAL**

SSC LABORATORY - CONTRACT #DEACO288ER40486 - MAJOR SUBCONTRACTORS

MAJOR SUBCONTRACTORS												
REPORT PERIOD										FROM: 11/26/89		\$ IN 000'S
										TO: 12/31/89		
CURRENT PERIOD					CUMULATIVE TO DATE					FY 90		
BCWS	BCWP	ACWP	VARIANCE		BCWS	BCWP	ACWP	VARIANCE	BAC	LRE	VARIANCE	
				SCHEDULE COST					SCHEDULE COST			
CONTRACT												
BROOKHAVEN NATIONAL LAB	2,071	2,071	2,071	0	0	3,459	3,459	3,448	0	11	16,716	
FERMILAB	1,732	1,732	1,732	0	0	3,741	3,741	3,740	0	1	13,000	
LAWRENCE BERKELEY LAB	408	408	408	0	0	902	902	900	0	2	3,500	
LOCKHEED	128	128	136	0	-8	353	353	333	0	20	2,500	
RTK	855	855	475	0	380	1,630	1,630	3,074	0	-1,444	6,565	
TEXAS ACCELERATOR CENTER	0	0	0	0	0	0	0	0	0	0	2,247	
SUBTOTAL	5,194	5,194	4,822	0	372	10,085	10,085	11,495	0	-1,410	44,528	
SSCL/OTHER	7,190	7,190	5,247	0	1,943	18,263	18,263	14,715	0	3,548	152,199	
TOTAL	12,384	12,384	10,069	0	2,315	28,348	28,348	26,210	0	2,138	196,727	

SSC PROJECT

MILESTONE STATUS REPORTS

This section includes the following:

- Startup (Near Term) Milestones
- SSC Master Milestones

The Startup (Near Term) Milestones represent key events and objectives associated with management systems implementation and SSC Project startup. These startup milestones were agreed upon by DOE and SSCL Management during August, 1989.

The SSC Master Milestones include the level one and two milestones for the SSC Project included in the SSC Project Management Plan (PMP). Following approval of the PMP and establishment of the SSC baseline, slippage of any of these milestones by more than three months will require DOE approval. The SSC Master Milestone Status Report will be included in each Monthly Progress Report for the duration of the project.

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

<u>MIL NO.</u>	<u>WBS NO.</u>	<u>MILESTONE DESCRIPTION</u>	<u>COMPLETION DATE</u>			<u>COMMENTS</u>
			<u>ORIGINAL PLAN</u>	<u>CURRENT PLAN</u>	<u>ACTUAL</u>	
1	2.0	AE/CM Criteria	3/89		4/89	
2	2.0	Start Geotech	5/89		6/89	First Phase Complete
3	3.0	SE/I RFP Issued	6/89		6/89	
4	2.0	Footprint Fixed	8/89		8/89	
5	3.0	SE/I Contract Award	8/89		10/89	
6	3.0	First Draft PMP Issued To DOE	8/89		8/89	Subject of Semi Annual Review
7	4.0	DOE Approval To Proceed With In-House Design For Early Critical A-E/CM Activities	8/89		8/89	Official 10/2
8	2.0	Land Acquisition Footprint Specification Documentation Complete	8/89		9/89	
9	1.0	MIP RFP	9/89	3/90	--	
10	3.3	Key Finance Staff Hired	9/89		9/89	
11	2.0	First Tunnel Section Location Set	9/89		9/89	
12	1.0	Tunnel Cross Section Defined	9/89		10/89	
13	3.0	First DOE Semi Annual Review	9/89		9/89	

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

MIL NO.	WBS NO.	MILESTONE DESCRIPTION	COMPLETION DATE			COMMENTS
			ORIGINAL PLAN	CURRENT PLAN	ACTUAL	
14	3.3	SSCL Accounting System In WBS Format Shown in August Monthly Report	9/89		11/89	In October Report
15	3.3	Deltek Accounting System Operational	9/89		9/89	October 1 Initialization
16	3.3	Key Procurement Staff Hired	9/89		9/89	All Key Positions Filled
17	3.3	Procurement Policies Procedures Manual Complete and Issued	9/89		9/89	Submitted To DOE-CH For Review And Approval
18	3.3	Deltek Purchasing Module Operational	9/89		9/89	
19	3.4	SSCL Vax Delivered	9/89		10/89	
20	3.1	PMRS Software Installed and Tested	9/89		9/89	
21	3.1	Eng. Mgmt. System Plan - Final Draft Issued	9/89	1/90		
22	2.0	First SEIS Draft Issued	10/89		10/89	
23	2.0	AE/CM Contract	10/89	5/90		
24	3.1	PMRS Implementation Complete	10/89		10/89	Software Implementation
25	3.4	MIS Hardware Operational	10/89		10/89	
26	3.1	Config. Mgmt. Plan Complete	10/89	1/90		
27	3.4	Draft Document Control Plan Issued	10/89		10/89	

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

<u>MIL NO.</u>	<u>WBS NO.</u>	<u>MILESTONE DESCRIPTION</u>	<u>COMPLETION DATE</u>			<u>COMMENTS</u>
			<u>ORIGINAL PLAN</u>	<u>CURRENT PLAN</u>	<u>ACTUAL</u>	
28	2.6	AE/CM-SSC Performance Objectives & Syst. Requirements Revisions Complete	10/89			
29	3.0	Issue First Funding Directive	10/89		10/89	
30	3.0	First C/SCS Report Test	10/89		11/89	October Data
31	1.0	Collider Dipole Criteria Established	10/89	1/90		
32	3.0	Initial Baseline Issued	11/89	1/90		
33	3.1	First Monthly Report With Automated PMRS	11/89		11/89	Test CPR
34	3.1	Baseline Cost Estimate Complete	11/89	1/90		
35	3.2	SEMP Approved and Issued	11/89	1/90		
36	3.1	PMP - Final Draft Issued	11/89	1/90		
37	3.1	Key QA Staff Hired	11/89	1/90		
38	3.5	ES&H Management Plan	11/89	1/90		
39	3.5	ES&H Final Draft Issued	11/89	1/90		
40	3.1	SSC WBS/WBS Dictionary Complete and Issued	11/89	1/90		
41	1.0	Prototype Dipole Specification Complete	11/89	2/90		
42	1.0	Magnet Criteria Complete	11/89	2/90		

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

<u>MIL NO.</u>	<u>WBS NO.</u>	<u>MILESTONE DESCRIPTION</u>	<u>COMPLETION DATE</u>			<u>COMMENTS</u>
			<u>ORIGINAL PLAN</u>	<u>CURRENT PLAN</u>	<u>ACTUAL</u>	
43	3.3	Deltek Procurement Interface Program Implemented	12/89			
44	3.1	Configuration Management Policy Statement Issued	12/89			
45	3.4	Document Control Policy Statement Issued	12/89			
46	2.6	CCD-Procedures Manual Second Draft Issued	12/89			
47	3.0	Supplemental Site Specific CDR Issued	12/89		12/89	
48	3.0	Start Baseline Validation	1/90			
49	3.1	QA Policies and Procedures Complete	1/90			
50	3.1	QA Data Base Requirements Document Issued	1/90			
51	2.1	AE/CM-Complete Near Term Work Authorization Packages	1/90			
52	4.0	First Land Tract Available	1/90	3/90		Footprint Approval Req'd.
53	1.0	Award Magnet Prototype Contract	1/90	7/90		
54	2.0	Award MTL/MDL Facilities Cold Test Fabrication Contract	1/90			
55	3.3	Final AAAP Approved and Issued	2/90			
56	3.1	DOE/CSCSC Readiness Review	2/90	6/90		Determined by DOE

SSC PROJECT

STARTUP (NEAR TERM) MILESTONES

<u>MIL NO.</u>	<u>WBS NO.</u>	<u>MILESTONE DESCRIPTION</u>	<u>COMPLETION DATE</u>			<u>COMMENTS</u>
			<u>ORIGINAL PLAN</u>	<u>CURRENT PLAN</u>	<u>ACTUAL</u>	
57	3.1	PMP Approved and Issued	2/90	4/90		
58	2.6	CCD-Procedures Manual Issued	2/90			
59	3.0	Baseline Validation Complete	2/90	5/90		
60	4.0	Supplemental Environmental Impact Statement Issued	2/90			
61	2.0	A-E/CM On Board	2/90	6/90		

SSCL - MASTER MILESTONE STATUS REPORT

As Of: 1/8/90

NO.	MIL LEVEL	WBS NO.	TITLE		* BASELINE PLAN	CURRENT PLAN	ACTUAL
M1-1	1	3.1.1	PM	First DOE Semiannual Review	Sep-89		Sep-89
M1-2	1	1.1.6	Collider System	Start Design	Feb-90		
M1-3	1	3.1.1	PM	Start Construction Project	Oct-89		Oct-89
M1-4	1	1.1	Injection System	Start Design	Mar-90		
M1-5	1	3.1.1	PM	SCDR Issued	Dec-89		Dec-89
M1-6	1	3.0	Footprint	DOE Approval	Feb-90		
M1-7	1	3.1.1	PM	Baseline Validation Complete	May-90		
M1-8	1	3.1.1	PM	PMP Approved By DOE	Apr-90		
M1-9	1	3.0	AE/CM	Award of Contract	Jun-90		
M1-10	1	3.0	SEIS	Record of Decision	Sep-90		
M1-11	1	2.4	Collider Ring	Start First Tunnel Construction	Oct-90		
M1-12	1	2.2	Campus Structures	Complete	May-94		
M1-14	1	1.1.6	Collider System	Complete Design	Oct-96		
M1-15	1	2.4	Collider Ring	Complete Conventional Construction	Oct-96		
M1-16	1	1.1	Injection Systems Operational		Sep-97		
M1-17	1	1.0	Collider System	Complete Acceptance Tests	Sep-98		
M1-18	1	1.0	SSC Operational		Sep-98		

* BASELINE VALIDATION SCHEDULED FOR COMPLETION MARCH, 1990.

SSCL - MASTER MILESTONE STATUS REPORT

As Of: 1/8/90

NO.	MIL LEVEL	WBS NO.	TITLE	* BASELINE	CURRENT	ACTUAL
				PLAN	PLAN	
M2-1	2	3.1.1	PM	Issue First Draft PMP	Aug-89	Aug-89
M2-2	2	3.1.1	PM	Award SE&I Contract	Oct-89	Oct-89
M2-3	2	3.1.1	PM	First C/SCSC Test Report Issued	Nov-89	Nov-89
M2-4	2	3.1.1	PM	First Land Tract Available	Aug-90	
M2-5	2	2.1.3	Infrastructure	Start Collider Infrastructure Design	Jun-90	
M2-6	2	2.4	Collider Ring	Start Design	Jun-90	
M2-7	2	2.1.1	Infrastructure	Start Campus Infrastructure Design	Jun-90	
M2-8	2	2.1.2	Infrastructure	Start Injector Infrastructure Design	Jun-90	
M2-9	2	2.1.4	Infrastructure	Start Exper Halls Infrastructure Design	Jun-90	
M2-10	2	2.2.1	Campus Labs/Offices	Start Design	Jun-90	
M2-11	2	2.3	Injector Facilities	Start Design	Jul-90	
M2-12	2	3.1.1	PM	Ready For C/SCSC Validation	Jun-90	
M2-13	2	1.2.6.1	Collider Dipole Magnets	Award Preproduction Contract	Aug-90	
M2-14	2	1.2.6.2	Collider Quad Magnets	Award Preproduction Contract	Sep-90	
M2-15	2	2.2	Camp Hv Wks/Shops/Sup.Bldgs	Start Design	Sep-90	
M2-16	2	1.1.6	Collider Components	Start Fabrication	Jun-91	
M2-17	2	2.4.3	Collider Ring	Start Construction West Cluster Tunnel	May-91	
M2-18	2	2.5	Experimental Facilities	Start AE/Design	Jul-91	
M2-19	2	2.4.4	Collider Ring	Start Construction East Cluster Tunnel	Apr-91	
M2-20	2	1.1.2	LINAC	Complete Fabrication	Jun-93	
M2-21	2	3.1.1	PM	Land Acquisition Complete	Jun-92	
M2-22	2	1.2.6.1	Collider Dipole Magnets	Start Production	Apr-94	
M2-23	2	1.2.6.2	Collider Quad Magnets	Start Production	Nov-94	
M2-25	2	2.4.3	Collider Ring	Complete Construction West Cluster Tunnel	Jun-95	
M2-26	2	1.1.2	LINAC Operational		Jan-95	
M2-27	2	1.1.3	LEB	Complete Fabrication	Oct-94	
M2-28	2	1.1.3	LEB Operational		Jun-95	

SSCL - MASTER MILESTONE STATUS REPORT

As Of: 1/8/90

NO.	MIL LEVEL	WBS NO.	TITLE	* BASELINE PLAN	CURRENT PLAN	ACTUAL
M2-29	2	1.1.6	Collider System	Complete Acceptance Test Sector A		Aug-94
M2-30	2	1.1.6	Collider System	Complete Acceptance Test Sector B		Mar-97
M2-31	2	2.4	Collider Ring	Complete AE/Design		Jun-94
M2-32	2	2.4.4	Collider Ring	Complete Construction East Cluster Tunnel		Mar-96
M2-34	2	1.1.4	MEB	Complete Fabrication		Jan-95
M2-35	2	1.1.4	MEB Operational			Jan-96
M2-36	2	1.1.6	Collider System	Complete Acceptance Test Sector K		Sep-97
M2-37	2	1.1.6	Collider System	Complete Acceptance Test Sector C		Oct-96
M2-38	2	2.3	Injector Facilities	Complete Construction		Feb-96
M2-39	2	2.5.2	Experimental Facilities	Complete Construction		Jun-95
M2-40	2	1.1.5	HEB	Complete Components Fabrication		Aug-95
M2-41	2	1.2.5.1	COL Dipole Magnets	Complete Fabrication		Jan-98
M2-42	2	1.2.5.2	COL Quad Magnets	Complete Fabrication		Jan-98
M2-43	2	1.1.6	Collider System	Complete Acceptance Test Sector J		Jul-97
M2-44	2	1.1.6	Collider System	Complete Acceptance Test Sector H		Apr-96
M2-45	2	1.1.5	HEB Operational			Sep-97
M2-46	2	1.2.5.1	COL Dipole Magnets	Complete Installation		Mar-98
M2-47	2	1.2.5.2	COL Quad Magnets	Complete Installation		Mar-98
M2-48	2	1.1.6	Collider System	Complete Acceptance Test Sector D		Nov-95
M2-49	2	1.1.6	Collider System	Complete Acceptance Test Sector F		Dec-96
M2-52	2	1.1.6	Collider System	Complete Acceptance Test Sector E		May-97
M2-53	2	1.1.6	Collider System	Complete Acceptance Test Sector G		Oct-96

MEETINGS/CRITICAL EVENTS

<u>Date</u>	<u>Meeting Subject</u>	<u>Participants</u>	<u>Location</u>
1/19-20	US HEP Research Program for 1990's	100 or more attendees	SSCL
2/5-6	SSC Board of Overseers	20 Attendees	SSCL
2/9-10	Program Advisory Committee	23 Attendees	SSCL