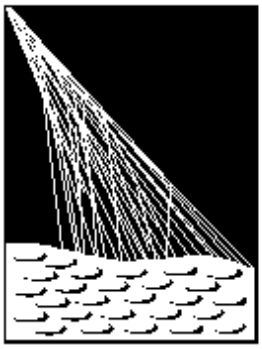
The
Pierre Auger Project



PIERRE
AUGER
OBSERVATORY

Project Management Plan

Including the

Auger Observatory Upgrade

Version 7 – 7 March 2017

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The Auger Observatory Project Management Plan
Version 5 – 28 January 2015

Revision History

Version	Date	Section No.	Specifics
1	16-JUL-1999	2.1.1 Figure	Changed flow
2	16-JUL-1999	Appendices E and F	Replaced MOU with URL
3	22-MAY-2001	1.3	Added "Agreement on Organization" and "Conventions"
3	22-MAY-2001	1.3.2	Added description of "The Agreement on Organization"
3	22-MAY-2001	1.3.4	Added definition of "Conventions"
3	22-MAY-2001	1.3.8	Changed tense
3	22-MAY-2001	2.1.1	Added description of the "Agreement for Organization"
3	22-MAY-2001	2.1.4	CERN chosen as Executive Financial Institution
3	22-MAY-2001	2.1.5.2	Section added on Construction Funds. Approved by the Auger Finance Board, CERN, 23 June 2000.
3	22-MAY-2001	2.1.5.3	Section on Common Funds. Approved by the Auger Finance Board, CERN, 23 June 2000
3	22-MAY-2001	2.1.5.4	Section added on the Operating Fund. Text approved by the Auger Finance Board, CERN, 23 June 2000: the Collaboration Board Meeting, 16 Nov 2000, and revisions confirmed by the Finance Board telecom, 30 Nov 2000.
3	22-MAY-2001	2.3.5	Corrected typos
3	22-MAY-2001	2.3.6	Added spokespersons to the Technical Board
3	22-MAY-2001	2.3.7	Under *Other Considerations*: changed Parent Institutions to host country
3	22-MAY-2001	2.3.10	Added Task Responsibilities – Approved by the Auger Finance Board, CERN, 16 Nov 2000
3	22-MAY-2001	2.5	Changed to reflect the current organization
3	22-MAY-2001	2.5.5	Deleted text on site-specific tasks as redundant with the WBS
3	22-MAY-2001	2.6.2	Membership definitions added at Collaboration Board meeting, Malargue, 16 April 2000
3	22-MAY-2001	3.5	Added photomultipliers
3	22-MAY-2001	3.8	Added current group name: Data Processing and Analysis

3	22-MAY-2001	4.3.6	Simplified cost estimation procedures
3	22-MAY-2001	4.4	Cost tracking procedures simplified
3	22-MAY-2001	12.0	Publication/Authorship Policy revised by vote of the Auger Collaboration Board meeting, Malargue, 3 May 2001
3	11-JUN-2001	10.0	Revised Quality Assurance section
3	12-JUN-2001	9.0	Revised Document Control section
3	26-JUN-2001	2.1.2	"Governments" replaced with "funding agencies"
3	26-JUN-2001	2.3.1	Included Co-spokesperson
3	26-JUN-2001	2.3.5	Added appointment and approval of Deputy Project Manager
3	26-JUN-2001	2.3.7	Removed "coordinate housing for visitors"
3	26-JUN-2001	2.3.7	Added authority to restrict access for those without adequate insurance
3	26-JUN-2001	2.3.7	Revised Site Manager's employing institution
3	26-JUN-2001	2.5.4.1	Deleted section on layout and negotiation of access
3	26-JUN-2001	2.6.3	The Spokesperson, Co-spokesperson, and Project Manager are elected by the Collaboration Board
3	26-JUN-2001	4.2.3	Cost estimates for construction will be in 2001 US dollars
3	26-JUN-2001	12.3	Publications Committee nominates 3 people to a "Paper Committee"
3	7-SEP-2001	12.5	Changed data access from any member to full members
3	7-SEP-2001	App. A	Updated Collaboration list
3	7-SEP-2001	App. B	Updated Task Leader list
	5-DEC-2003	12.1	Revised Publications & Authorship Policy
1	5-DEC-2003	2.3	Replaced Organizational Chart
	9-DEC-2003	9.1	Replaced Controlled Documents flow chart
	19-NOV-2004	2.6.6	Added Elections page for By-Laws
			Fund Ops. Operation by Collaboration Board on 9 March 2011
3.1	20-MAY-2011	12	Added criteria for short author list papers
3.1	8-JUL-2011	2.1	Replaced global organization chart (Fig. 1)
4	8-MAY-2013	1.3.2	Added International Agreement for operations
4	8-MAY-2013	2.1.2	For consistency with the International Agreement
4	8-MAY-2013	2.1.3	For consistency with the International Agreement
4	8-MAY-2013	2.1.4	For consistency with the International Agreement
4	8-MAY-2013	2.1	Updated organization chart
4	8-MAY-2013	2.1.5.1	MOU for Operations added
4	8-MAY-2013	2.2	For consistency with the International Agreement
4	8-MAY-2013	2.3.1	For consistency with the International Agreement
4	8-MAY-2013	2.3.2	One site
4	8-MAY-2013	2.5.2	For consistency with the International Agreement

4	8-MAY-2013	2.5.3	Added enhancement and upgrade phase
4	8-MAY-2013	3.9	Implemented in April 2007
4	8-MAY-2013	Appendix	Links to current documents
5	28-JAN-2015	7.3	Decommissioning
5	28-JAN-2015	2.1.7	Physics Analysis and Detector Performance
6	23-Jun-2016	2.1.7	MoU Policy for external collaborations
7	7-Mar-2017	3.	Task definitions update and new tasks
7	8-Mar-2017	2.6.6	Updated election rules

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Appendix

1 Project Description

3.3 Introduction

This document describes the organization of the Pierre Auger Project. The main body of the Project Management Plan details the tasks and duties of leaders and methodology for controlling costs, schedule and quality.

1.2 Scientific Objective (Revised 28-JAN-2015)

Over the past forty years cosmic ray showers detectors have recorded a number of events with energies greater than 10^{20} eV. In 1991, the collaboration operating the Fly's Eye atmospheric fluorescence detector in Utah recorded an event for which the primary energy was calculated to be $3.2\pm 0.9 \times 10^{20}$ eV (51 joules). Two years later, the AGASA air shower array at Akeno, Japan, observed an event with energy of $(1.7\text{-}2.6) \times 10^{20}$ eV. These super high-energy events are extraordinary for two reasons. First, there are no known acceleration mechanisms that can produce particles of these energies. Second, characteristic lengths for energy loss of cosmic ray protons with energy greater than 1.5×10^{19} eV is less than about 50 Mpc. This attenuation (known as the Greisen-Zatsepin-Kuzmin cut off) results from the interaction of cosmic ray particles with the cosmic microwave background. Thus, particles can have these energies only if they are produced relatively nearby. The high magnetic rigidity of these particles also means that they suffer little deflection from magnetic fields in the galaxy and in intergalactic space. The objective of the Pierre Auger Project are to measure the arrival direction, energy and mass composition of cosmic ray with energies from 10^{18} eV to above 10^{20} eV.

Since the completion of the Auger Observatory in 2008, both a strong cosmic-ray flux suppression at the highest energies and a sharp spectral transition near $10^{18.7}$ eV (*the ankle*) have been observed. Presently it is not possible to determine whether the suppression is due to energy losses in transit (the GZK effect) or if it reveals the maximum energy of the source accelerators. With the objective of providing an answer to this question an upgrade of the Observatory has been designed. The primary goal is a better identification of the primary composition, especially extending to the highest energies. An event-by-event understanding of the identities of the particles will improve the quality of several analyses, including (i) anisotropy study, by using only small-Z particles; (ii) seeking evidence of a maximum accelerator energy (E μ Z), by observing the primary mass increasing as the flux declines; (iii) study features of hadronic interactions at energies well beyond those of LHC. Moreover, explicit experimental confirmation of the existence of even a small (~10%) flux contribution of light elements at the highest energies will be a decisive ingredient for assessing the physics potential of existing and future cosmic ray, neutrino, and gamma-ray detectors.

1.3 Principal Documents (Revised 22-MAY-2001)

The following documents comprise the basis for the construction and operation of the Pierre Auger Cosmic Ray Observatory. In most cases these documents will have to be updated to reflect the needs of the Auger Upgrade.

1. Design Report
2. Agreement for the Organization, Management, and Funding of the Pierre Auger Observatory
3. Performance Requirements and Technical Specifications
4. Conventions
5. Technical Design Report
6. Project Management Plan
7. Engineering Drawings
8. Quality Assurance Plan
9. Cost Estimate (Work Breakdown Structure)
10. Integrated Project Schedule
11. Operations Plan

1.3.1 Design Report

The Auger Design Report is the technical definition of the project. The first Design Report was issued in October of 1995. The Design Report was revised and reissued November 1996.

1.3.2 Agreement for the Organization, Management and Funding of the Pierre Auger Observatory (Revised 8-MAY-2013)

The purpose of the International Agreement is to define the framework for the organization, management, and funding required for the construction, commissioning and operation of the Pierre Auger Observatory. There are two versions. The original Agreement largely addressed the Observatory construction. The more recent International Agreement addresses the Observatory operation. The provisions of the International Agreement supersede those of the Agreement. These documents may be found at auger.org/admin.

- Agreement for the Organization, Management and Funding of the Pierre Auger Observatory (16 March 1999)
- International Agreement for the Organization, Management and Funding for the Operation of the Pierre Auger Observatory (8 May 2013)

1.3.3 Performance Requirements and Technical Specifications (Revised 28-JAN-2015)

The Auger Performance Requirements and Technical Specification document together with the set of all engineering drawings constitute the design configuration for the Auger Observatory. The documents are under configuration change control.

1.3.4 Conventions (Revised 28-JAN-2015)

These are a set of conventions adopted by the Auger Collaboration for use in building the Observatory, Observatory upgrades and analyzing the data. These conventions include the

coordinate system, time, date, pixel numbering, etc. The conventions document may be found at: https://edms.cern.ch/cedar/plsql/doc.info?cookie=7032781&document_id=317390&version=1

1.3.5 Technical Design Report (revised 28-JAN-2015)

A Technical Design Report was prepared as part of the Preliminary Design Review Process. The Technical Design Report describes in detail the base line design for the Auger Observatory. As the design proceeded through the Final (Critical) Design Phase the Technical Design Report was revised to reflect changes prior to the design. Similarly, an Upgrade Technical Design Report describes the baseline design for the upgrade.

1.3.6 Project Management Plan

The Project Management Plan sets out the organization, management responsibilities and procedures used in construction and operation of the Pierre Auger Cosmic Ray Observatory.

1.3.7 Engineering Drawings

The complete set of engineering drawings together with the Performance Requirements and Technical Specifications document constitutes the observatory configuration. The engineering drawings are entered into a strictly controlled data base, currently the EDMS at CERN.

1.3.8 Quality Assurance Plan

The Pierre Auger Project has established a Quality Assurance Plan to assure the performance and reliability of the detector systems. Quality Assurance is an integral part of the project's design, procurement, assembly and test processes. Responsibility for quality resides at all levels of the organization.

The overall Quality Assurance Plan was established by the Project Manager and the Project Quality Assurance Officer. The Project Quality Assurance Plan contains the Quality Assurance requirements that all groups and subsystems must address. Using the Quality Assurance requirements, each Task Leader has developed a quality system or plan that documents their approach and methods for achieving quality components and services. The Quality Assurance Officer assists the Project Manager and Task Leaders in developing their Quality Systems, and audits their implementation.

1.3.9 Cost Estimate

All labor and materials required for the successful completion of the Pierre Auger Observatory are contained in the Work Breakdown Structure (WBS). A new WBS is prepared for the upgrade of the Observatory. The WBS contains a complete definition of the scope of the project and forms the basis of planning, costing, scheduling, execution and control of the Auger Project and subsequent upgrades.

1.3.10 Integrated Project Schedule

The Integrated Project Schedule is constructed from the work tasks detailed in the WBS. Each task is entered together with precursors and the estimated time for completion. Resources are added to achieve project milestones. The schedule is used to track progress on the project.

1.3.11 Operations Plan

When the project moved into the data taking phase, an operation plan was prepared that ensures that the data taking and analysis is accurate and efficient.

2 Project Organization

2.1 Global Organization

2.1.1 Introduction (Revised 22-MAY-2001)

An international undertaking such as the Pierre Auger Project requires administrative oversight by the science and funding agencies of the participating countries. The oversight is exercised by a Finance Board and a Collaboration Board. An Executive Financial Institution acts as financial agent for the construction and subsequent operation of the Pierre Auger Observatory. The global organization was established by an agreement among the funding agencies of the countries committing support to the construction and operation of the Auger Observatory. The agreement contains a statement of continuing support of the Auger Project, rules for the movement of experimental equipment through customs, a statement regarding ownership of Observatory property, tax status and related issues. The Pierre Auger global organization is shown in Figure 1.

2.1.2 Finance Board (Revised 8-May-2013)

The Finance Board is the governing body for oversight of the financial aspects of the Collaboration and works by the consensus of its members. The Finance Board provides the mechanism whereby the Parties to the International Agreement exercise oversight of the Pierre Auger Project. The Parties to the International Agreement are the institutions funding the construction and operation of the Pierre Auger Observatory.

The Finance Board determines by unanimous agreement its own rules of procedure, which shall be reported to the Parties.

The Finance Board consists of members appointed by each Party that is a signatory to the International Agreement.

Each Party to the International Agreement is entitled to designate a member of the Finance Board. The Parties should avoid potential conflicts of interest in the designation of the Finance Board members.

The Collaboration will provide reports through the Spokespersons and Project Manager to the Finance Board on the status and proposed plans, including financial plans, of the observatory.

The Finance Board will review and approve yearly budget requests and financial reports. It will also examine the reports from the Project Manager and Spokespersons to ensure that schedule and budgetary goals are being met.

The Finance Board Chairperson is elected from the members of the Finance Board by the members of the Finance Board to serve for a term of two years.

The Finance Board is to meet at least on an annual basis in a place chosen by its members. The Finance Board meeting will have as an item on its agenda the approval of the Annual Financial Report and Budget.

2.1.3 Collaboration Board (Revised 8-May-2013)

The Collaboration Board is the oversight body concerned with scientific and technical aspects of the Collaboration and the Pierre Auger Observatory. It deals with issues including governance of the Collaboration, scientific policy, new members and institutions, publication policy and monitoring the operation of the Pierre Auger Observatory to ensure that the scientific objectives are being met.

The members of the Collaboration Board are appointed by their home institutions among the scientists participating in the Pierre Auger Collaboration, according to the Collaboration bylaws

The Chairpersons of the Collaboration Board are elected from the membership to a renewable two-year term. Details on organization of the Collaboration Board are described in its bylaws, Section 2.6.

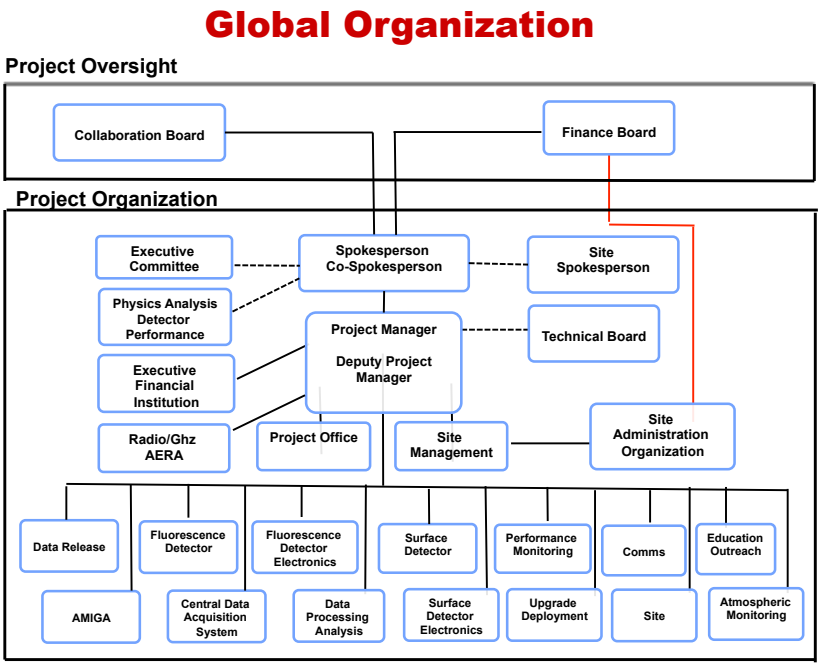

Figure 1. Pierre Auger global organization chart (Revised 8-May-2013).

2.1.4 Executive Financial Institution (Revised 8-May-2013)

The Finance Board identifies the Executive Financial Institution that collects, holds and disburses funds at the request of the Project Manager for use in the operation of the Auger Observatory.

2.1.5 Commitments (Revised 8-May-2013)

2.1.5.1 Memoranda of Understanding (Revised 28-JAN-2015)

Project tasks and contributions from each of the collaborating institutions are negotiated by the Spokesperson and the Project Manager. A Memorandum of Understanding (MOU) among the Auger Project, each collaborating institution and its associated funding agency will detail the scope of work, deliverables, the level of contribution to the common fund, the work schedule, and funding arrangements. In like manner a Memorandum of Understanding for Operations is negotiated with each collaborating institution which describes specific continuing commitments to operations and maintenance of the Observatory and data analysis structure. A Memorandum of Understanding for the Upgrade with each collaborating institution describes the scope of work, deliverables, the level of contribution to the common fund, the work schedule, and funding arrangements

2.1.5.2 Construction Funds (Added 22-MAY-2001)

Construction funds for the Observatory and subsequent upgrades comes by way of contribution of components and equipment from the participating countries and from the common fund. The common fund is a mechanism by which countries contribute to the common procurement of photomultiplier tubes for both fluorescence detector and the ground array.

2.1.5.3 Common Funds (Added 22-MAY-2001)

The Common Fund was intended to cover costs of photomultiplier tubes for all detectors as well as some restricted operating costs during construction. For the Auger Upgrade the common fund is intended to cover costs that cannot be provided by in-kind contributions.

2.1.5.4 Operating Fund (Added 22-MAY-2001)

An operating fund has been established and is controlled in the same manner as the Common Fund. The use of the operating fund is highly restricted so that such funds are not to be used for expenditures properly, which are the responsibility of the Task Groups. Features of the proposed Operating Fund:

1. All participating countries would contribute to the Operating Fund.
2. The Operating Fund use is restricted to those costs necessary for the routine operation of the observatory. Operating expenses associated with the assembly, deployment and maintenance of detectors remain the responsibility of the Task Group until the Observatory has transitioned to data taking.

3. The Project Manager will submit the operating budget in September for the coming year to the Spokesperson and the Finance Board.
4. Auger collaborating countries contribute to the Operating Fund in proportion to the number of authors who sign publications. These authors include engineers and PhD physicists who have made a major contribution to the Project. The numbers will be submitted to the Spokesperson and Project Manager in November preceding the year for which Operating Fund allocations will be made.
5. Countries unable to contribute their share of operating funds may petition the Spokesperson for special consideration.

2.1.6 Executive Committee (Added 07-MARCH-2008)

Executive Committee will assist the spokesperson and project manager in the decision making process and in defining the actions to be taken to implement the decisions made by the Collaboration Board. It will meet regularly at each Collaboration meeting and in between meetings by video/teleconference. It will report to CB regularly.

The Executive Committee is composed of:

- The spokesperson (chair)
- The co-spokesperson
- The chair of the Collaboration Board
- The co-chair of the Collaboration Board
- The Project manager

Agenda and minutes of the meetings will be made available to the Collaboration

2.1.7 Physics Analysis and Detector Performance (Added 23-FEB-2015)

The Physics Analysis and Performance Coordinators coordinate and assess activities concerning science topics of interest, including the simulation, analysis, and optimization of the physics performance of the Pierre Auger Observatory. They are appointed by the Spokesperson for a renewable three year term and are approved by the Collaboration Board.

The Physics Analysis and Detector Performance are broken down into a number of analysis tasks each with its own leaders. This structure, the "Auger House", is subject to regular updates by the Physics Analysis and Performance Coordinators in consent with the spokespersons whenever new major topics of interest are identified or when topics have been terminated. The Physics Analysis and Detector Performance Coordinators are in frequent contact with the spokespersons, they will regularly participate in detector analysis and performance phone calls, and will report to the collaboration in typically three months periods.

MoUs between the Pierre Auger and other Collaborations open the possibility of collaborating on various joint analysis projects. As defined by the inter-collaborative MoUs, membership in inter-collaborative working groups will be open to all members of the involved collaborations. Any member of the Auger Collaboration may propose an inter-collaborative analysis to be discussed

and approved by the relevant Auger analysis tasks, and by the inter-collaborative working group. Similarly, analysis proposals made by the partner collaboration will be reported to the relevant Auger analysis tasks. At all phases of the analysis, the progress of the inter-collaborative working group will be regularly reported to the relevant Auger analysis tasks. It is understood that analyses performed within the inter-collaborative working groups will be presented to the Auger Collaboration.

2.2 Project Organization (Revised 1-May-2013)

The scientific and technical direction of the project is invested in the Spokesperson by the Collaboration Board. The Project Manager is responsible for construction and operation of the Auger Cosmic Ray Observatory and reports to the Spokespersons. The Project Manager is supported by the Project Office staff which includes engineering, budget and administrative personnel, and by the Technical Board. A Site Manager directs operations on-site and reports directly to the Project Manager. Task Leaders are responsible for the major components of the detectors and infrastructure.

2.3 Project Offices and Responsibilities

2.3.1 Spokespersons (Revised 8-May-2013)

The Auger Project Spokespersons are elected by the Collaboration and are the representatives of the Collaboration in scientific, technical, and management concerns, and speaks and negotiate on behalf of the Collaboration. The Spokespersons are responsible for establishing the scientific goals and the means for the Collaboration to pursue these goals successfully. They are also expected to pursue the identification of resources needed by the Auger Project and to seek the commitment of such resources toward the construction and operation of the Observatory. These resources come from the scientific groups and institutions that collaborate in the Auger Project, as well as their various sources of funding for that purpose. The Spokespersons serve renewable three-year terms.

The Finance Board confirms the selection of the spokesperson.

2.3.2 Site Spokesperson (Revised 1-May-2013)

The Observatory has a designated Site Spokesperson. The spokesperson will be a member of the Collaboration. He or she will serve as liaison between the Project Spokesperson and the host country.

2.3.3 Collaboration Board

The Collaboration Board, whose membership consists of one representative selected by each collaborating institution, deals with issues which concern the Collaboration as a whole. These include the governance of the Collaboration, the policy on admission of new members and institutions, and publication policy.

2.3.4 Project Manager (revised 1-FEB-1999)

The Project Manager is responsible for the overall design, construction and operation of the Pierre Auger Observatory. The Project Manager's duties and responsibilities include the following:

1. Write and implement the Pierre Auger Project Management Plan for the construction and operation of the Auger Observatory and subsequent upgrades.

2. Organize, direct and control the day to day activities necessary to build, commission and operate the Auger Observatory so that Project technical cost and schedule objectives are met.

3. Prepare and maintain system configuration documents including the Performance Requirements and Technical Specifications, the Technical Design Report and engineering drawings.

4. Manage and coordinate interfaces among Project Task Groups.

5. Develop and maintain a complete description of components material and labor for the construction of the Project in the form of the Work Breakdown Structure (WBS).

6. Develop and maintain an integrated resource loaded project schedule for Observatory construction.

7. Track the progress of the project cost and schedule using the WBS and Schedule and established milestones and check points.

8. Prepare progress cost and schedule reports for the Spokesperson Collaboration Board, Finance Board, and funding agencies as required.

9. Develop and implement an Auger Project Quality Assurance Plan.

10. Develop and implement an Auger Project Environment, Safety and Health Plan.

11. Serve as chair of the Auger Technical Board.

12. Prepare with the Spokesperson the Memorandum of Understanding with collaborating institutions contributing to the construction and operation of the Observatory.

13. Hold and allocate contingency funds.

14. Establish and chair the Auger Configuration Control Board.

15. Schedule and carry out major reviews of Auger subsystems.

The Project Manager is appointed by the Spokesperson, approved by the Collaboration Board and confirmed by the Finance Board. The Project Manager serves an indefinite term. The Project Manager reports to the Project Spokesperson.

2.3.5 Deputy Project Manager (Revised 22-MAY-2001)

The Deputy Project Manager works with the Project in carrying out Project Manager responsibilities. The Deputy Project Manager acts as the Project Manager in his/her absence. The Deputy Project Manager is appointed by the Spokesperson in consultation with the Project Manager, and is approved by the Collaboration Board

2.3.6 Technical Board (Revised 22-MAY-2001)

The Technical Board consists of scientists and engineers involved in leadership roles in the various technical areas of the Auger Project. The members of the Technical Board are the Spokesperson, Task Leaders and others appointed by the Spokesperson and the Project Manager. The Technical Board is chaired by the Project Manager. The Technical Board advises the Project Manager and Spokesperson on technical issues pertaining to the design, fabrication and testing of the Auger detectors, assignment of tasks and other issues as required.

2.3.7 Site Manager (Revised 22-MAY-2001)

The Site Manager for the Pierre Auger Project is a key individual in the construction and operation of the Pierre Auger Cosmic Ray Observatory. The Site Manager is responsible for activities at the site both during construction and later during data taking operations. Once construction begins the Site Manager will be located at the site on a full time basis. The responsibilities of the Auger Project Site Manager are as follows. He/she shall:

1. Assume responsibility for all day to day operations at the site.

2. Hire and supervise the site staff in consultation with the Project Manager.

3. Have the primary responsibility for writing and administering contracts related to construction and maintenance at the site. All contracts will be written in consultation with the sponsoring agency (see Section 2.5.1), the Project Manager and approved by both.

4. Oversee the civil construction including roads, power, buildings, communication equipment, detector foundations and other site improvements.

5. Assist Task Groups in the receiving, inspection and storage of detector related equipment.

6. Oversee the deployment of the surface array detector stations, fluorescence detector stations and communications equipment. This work may be done with a combination of contractors, collaborating institutions and site staff.

7. Supervise the permanent staff during data taking. This staff will include observers, operators, and maintenance staff.

8. Maintain the Visitor Education Center.

9. Be the point of contact with land owners, local and state officials regarding the site.

10. Assume the responsibility for protecting the environment in accordance with the local, state or provincial and national laws.

11. Assume responsibility for safety for all project related individuals and equipment on site according to the Site Safety Manual. The Site Manager will conduct safety reviews of all incoming equipment as well as ongoing activities. The Site Manager will provide safety training to collaborators, contractors and visitors as required.

The Site Manager has the authority to exclude any individual from the site who does not follow safe work practices. The Site Manager has the authority to refuse equipment delivered to the site that he deems to be a hazard to safety, health or the environment.

Qualifications

The candidate for Auger Site Manager shall:

1. Have an academic degree in physics or engineering. It is preferred that the candidate have a strong interest in science.

2. Have at least five years management and supervisory experience.

3. Have experience in negotiating and administering contracts.

4. Have excellent verbal and communication skills.

Other Considerations

1. The Auger Site Managers are responsible to the Pierre Auger Collaboration and will report to the Pierre Auger Project Manager. The candidates for Site Manager will be recommended by the host country to the appropriate site spokesperson, Auger Spokesperson and Project Manager. The appointment must be ratified by the Auger Collaboration Board.

2. The Site Manager may be employed by a separate institution other than the Pierre Auger Observatory. Continuation as Site Manager is subject to satisfactory performance as determined by the Project Manager and the Auger Collaboration. .

2.3.8 Task Leader

The Task Leaders play a fundamental role in the construction and operation of the Auger Observatory. The Task Leader is responsible for coordinating all aspects of the Task from development of requirements through data taking operations. This responsibility includes administrative duties such as cost accounting, scheduling and progress reporting. It is expected that all tasks will be broken down into a number of subtasks each with its own leader. These Subtask Leaders will support the Task Leader in carrying out his duties. Task Leader reports to the Project Manager.

The responsibilities of a Pierre Auger Project Task Leader are as follows:

1. Define the requirements and specifications for the components (or software) of the Task. The information shall be entered and maintained in the Performance Requirements and Technical Specifications document.

2. Distribute subtask assignments among the collaborating institutions in coordination with the Spokesperson and Project Manager. Assist them in writing a Memorandum of Understanding with each participating institution defining the responsibilities and commitments of that institution related to the particular task involved.

3. Organize and coordinate the research and development effort within the Task. The Task Leader is responsible that the results of work in the R&D phase are summarized in frequent progress reports and written up in detail and distributed to the collaboration in a timely way.

4. Coordinate the design, coding, fabrication, assembly, testing, commissioning or other activities contained in the Task description. The design of the components is to be based on the Requirements and Specification document.

5. Determine a detailed list of jobs and related resources necessary for the manufacturing, delivery and installation of components for both sites. This information is to be entered and maintained current in the Project Cost Estimate (WBS) in accordance with the Auger Project Cost Estimation Procedures.

6. Develop a resource loaded schedule for activities within the Task.

7. Track cost and schedule including updates to work descriptions, cost estimates and work accomplished as the Project proceeds and provide progress reports to the Project Manager.

8. Implement a Quality Assurance and Inspection plan for the testing and acceptance of the Task components and/or software.

9. Oversee the production and delivery of the Task components to both sites.

10. Develop with the corresponding Site Manager a plan for the deployment, integration and commissioning of the Task components.

11. Develop with the corresponding Site Managers a plan for the operation and maintenance of the Task components. This should include integration of any diagnostics into the on-line monitoring system.

12. Circulate to the whole collaboration quarterly progress reports indicating the activities of the Task group for that month.

13. Organize Task presentations for internal and Project level reviews.

14. Assume responsibility for environmental, safety and health requirements, policies and procedures for the Task.

Other considerations

1. There are four distinct phases of the Pierre Auger Project that involve the Task Leaders:

a) R&D and design;
b) procurement and manufacturing;
c) installation and commissioning;
d) monitoring, maintenance and data taking.

All four phases could be carried out by one individual. Circumstances, however, may lead to having a rotating system and/or two or more people directing these different activities.

2. The Task Leaders are responsible to the Pierre Auger Collaboration and will report to the Pierre Auger Project Manager.

3. Their appointment must be ratified by the Pierre Auger Collaboration Board.

4. All contracts and purchases with Project funds above a certain amount must be approved and signed by the Pierre Auger Project Manager according to the Project Management Plan.

5. All contracts related to activities at the site must be negotiated with and approved by the corresponding Site Manager in consultation with the Pierre Auger Project Manager.

6. All Site labor, other than from collaborating institutions for the specific assignment of the Task Leader area of responsibility, shall be requested through the corresponding Site Manager.

2.3.9 Subtask Leader

Each task is nominally divided into a number of subtasks that constitute primary components or jobs to be delivered. Subtasks leaders are chosen by the task leaders and are subject to the approval of the Project Manager.

2.3.10 Task Responsibilities (Added 22-MAY-2001)

It is the responsibility of each Task Group to provide observatory components as described in the project Work Breakdown Structure and the Memoranda of Understanding of the participating institutions. These responsibilities shall include:

1. Fabrication of components. This includes components design, development, test, production and quality control
2. Delivery to the site. This responsibility shall include all transportation costs including off loading at a location at the observatory site agreed upon with the Site Manager.
3. Customs, taxes, insurance and broker fees. Auger equipment will be brought to the site tax free either by tax waiver or by donation. The Task Groups must pay any remaining fees to bring their equipment to the site.
4. Receiving and inspection. The Task Group is responsible for unpacking, testing, inventorying and storage of components and associated equipment. A hazard assessment of components and equipment delivered to the site will be provided to the site manager. Any equipment such as shelving or packaging is to be supplied by the Task Group.
5. Assembly and deployment. The Task Group is responsible for pre-deployment assembly, deployment, post-deployment assembly and testing. Any materials or equipment required for assembly and testing will be supplied by the Task Group including test instruments wiring and tools.
6. Special facilities. Any special requirements of modifications to the buildings beyond those included in the construction contract will be provided by the Task Group or from funding sources determined by the Finance Board.
7. Routine maintenance. The Task Group is responsible for routine maintenance on all their equipment until the observatory is complete, has transitioned to a data taking mode and a permanent site staff is in place. Maintenance procedures, operations manuals and test equipment are provided by the Task Group.
8. Long-term maintenance. The Task Groups remain responsible for the long term operation of components and equipment. This includes the provision of a reasonable set of spares.

2.4 Project Office (Revised 10-SEP-1999)

2.4.1 Definition

The Project Manager and Deputy Project Manager are assisted by personnel that make up the Project Office.

2.4.2 Cost and Schedule Officer

The Cost and Schedule Officer is responsible with the Project Manager for developing and tracking project cost and schedule. He/she will assist Task Leaders in developing task Work Breakdown Structures associated with project construction and will produce a project WBS. The project WBS will be used for tracking and controlling cost. The Cost and Schedule Officer will also assist the Task Leader in producing a resource loaded schedule which will in turn be used to produce an

integrated schedule for tracking and control. He/she will prepare summary cost and schedule reports as required by the Project Manager, Task Leaders, spokesperson and funding agencies. The Cost and Schedule Officer will participate in project planning, drafting of Memorandum of Understanding with participating institutions, and writing of contracts. He/she will be a member of the Change Control Board and the Technical Board.

2.4.3 Systems Engineer (Revised 27-AUG-1998)

The Systems Engineer is responsible, with the Project Manager, for project wide engineering coordination. The duties and responsibilities of the Systems Engineer include:

1. Auger Observatory Configuration Management including documents such as performance requirements, interface requirements and engineering drawings.

2. The technical interface among subsystems.

3. Overall system integration.

4. Organization of technical reviews, in cooperation with Task Leaders.

5. Assist in the development and maintenance of procurement contracts.

6. Assist in the development of Memoranda of Understanding with the Collaboration institutions.

7. Establishment and maintenance of material requirements and standards.

8. Serve as secretary of the Configuration Control Board and a member of the Technical Board.

2.4.4 Quality Assurance Officer

The Quality Assurance Officer develops and monitors the Quality Assurance Program to ensure performance and reliability of the detector and software systems. The Quality Assurance Officer will work with each Task Leader to develop a Quality Assurance Plan for task activities and will monitor its implementation.

2.4.5 Environment, Safety and Health Officer (added 25-AUG-1998)

The Pierre Auger Project Environment, Safety and Health Officer is responsible for developing and maintaining an ES\&H plan for construction and operation of the Pierre Auger Observatory. The ES\&H Officer works with each Task Leader to produce an ES\&H plan and will audit its implementation. He/she also works with the Site Managers to develop an ES&H plan for site operations.

2.4.6 Project Management Staff Support

The project support staff consists of a designer to assist the Systems Engineer in the system configuration, interfaces and integration and a clerical person to support the project management staff.

2.5 Pierre Auger Project Site Management Organization (Revised 22-MAY-2001)

2.5.1 Introduction

The Pierre Auger Project requires an organization at each site to prepare the site, oversee construction, conduct data taking operations and detector maintenance.

The Site Management Organization is formed by way of a contract with the Pierre Auger Project sponsoring agency within the host country. The Site Management Organization will be headed by the Site Manager. The Site Manager is under the technical direction of the Pierre Auger Project Manager.

Funds for the Site Management Organization are provided by the Pierre Auger Project participating as described above in Section 2.1.5.4, "Operating Funds"

2.5.2 Management Organization (Revised 8-May-2013)

2.5.2.1 Site Management Organization

The Site Management Organization is responsible for the day to day operation of the Observatory. These responsibilities include operation and maintenance of the detectors systems and infrastructure and assisting collaborators in the data taking. The Site Management Organization is headed by the Site Manager who reports to the Pierre Auger Project Manager. The Site Manager resides at the site and oversees all activities at the site and is responsible for hiring and supervising staff, technical oversight of contracts and procurement for operations and other site related work with the approval of the Project Manager. The specific duties of the Site Manager are described in 2.3.7.

2.5.3 Phases of Site Management (Revised 8-MAY-2013)

There are four distinct classes of site related activities in the Auger Project:

2.5.3.1 Site Layout and Negotiation of Access

These are activities when the site is surveyed, infrastructure planned, detector locations identified and environmental impact assessment and land access issues resolved.

2.5.3.2 Observatory Construction and Commissioning

1. Civil construction

This consists of construction of buildings, roads, power lines, etc.

2. Surface detector deployment
   This includes, incoming inspection, assembly, deployment and commissioning of the 1600 surface detector stations on each site.

3. Fluorescence detector deployment
   This includes the inspection, assembly, installation and commissioning of the fluorescence detectors and enclosures.

4. Detector upgrades
   This includes all work associate with the design, deployment and commissioning of surface detector upgrades.

2.5.3.3 Data Taking Operations

1. Data acquisition
   A small number of "observers" will monitor the operation of the detectors, the quality and management of data.

2. Maintenance
   A crew will be responsible for the maintenance of both the surface and fluorescence detectors, the data acquisition system and the physical plant.

2.5.3.4 Enhancements and upgrades

These are activities adding new or improving existing sub-detectors of the observatory.

2.5.4 Site Organization Staffing

2.5.4.1 Observatory Construction and Commissioning

During construction the site organization will consist of the Site Manager and a technical staff that assists the Auger Task Groups receives, inspect, deploy and test the detectors. In general the Auger Task Groups are responsible for the deployment and testing. The size and skills of the site staff depends on the amount of construction and commissioning work that is done by the Task Groups, outside contractors and the site staff itself.

2.5.4.2 Data Taking Operations

The projected staff for data taking operations at each site is shown below. The Site Organization staff during construction and commissioning will evolve into the operations staff as the construction is completed.

1. Operating Staff

a. Site Manager
   The duties and responsibilities are described in Section 2.3.7
b. Administrative clerk
c. Computer systems manager
   A computer professional for maintenance of the computer systems including trigger systems, on and off site communications, and data acquisition.
d. Electro-mechanical technicians (3)
e. Electronics technicians (2)
   Based on experience, five technicians will be required for maintenance of the fluorescence detectors and surface detector systems
f. Physicists/observers (3)
   Auger's detectors are comparable to astronomical observatories. Hence the presence of Master of Science-level physicists who will act as "observers" will assist, as time permits, with detector diagnostics and software and hardware maintenance.
g. General maintenance (2)

2.5.5 Site Organization Tasks (Revised 22-MAY-2001)

The observatory components are to be integrated and tested prior to delivery by the Auger Task Groups. The Task Groups are also responsible for inspection, assembly, deployment and test of equipment delivered to the site. The Task Groups are to supply documentation including detailed procedures for inspection, assembly, deployment and test. A complete safety and environmental hazard analysis will also accompany detector components. The Project Manager, the Task Leader and the Site Manager will determine the most expeditious distribution of effort among the Task Group, Site Management Organization and outside contractors for the inspection, assembly, deployment and test of the components.

The Work Breakdown Structure details a number of tasks during construction that may involve the Site Manager and his staff. These tasks will also involve members of the Task Groups and hired contractors as well as site staff.

2.6 Bylaws of the Auger Collaboration Board

2.6.1 Definition (revised 1-FEB-1999)

The Collaboration Board (CB) is the governing body of the collaboration.

- Composed of one representative per full-member institution subject to the level of participation (see 2.6.2.2).
-
- Can vote decisions if a quorum of 20 members (old CB) or 50% (new CB) is reached.

- Can modify bylaws with a qualifying majority of two thirds.

The CB deals with issues including governance, policy on admission of new members and institutions and publication policy. The following are the bylaws under which the Collaboration Board operates.

2.6.2 Membership (Revised 24-APRIL-2007)

2.6.2.1 Membership Definitions

2.6.2.1.1 Full Member Countries

A country is a full member of the Collaboration if it has signed the International Agreement and therefore is a member of the Finance Board.

2.6.2.1.2 Associate Countries

The status of "associate country" was created so as to give the possibility to developing countries to participate in the activities of the Collaboration without having strong obligations (financial or otherwise). Such a status has to be approved by the Collaboration Board. Country B may ask for association with the Collaboration through its cooperation with a full member country A. For all practical purposes, groups from country B have the same status as the associate groups (see below), particularly in what concerns the contribution to the operating costs which are the responsibility of country A. Associate countries do not have to report either to the Project Management or to the Finance Board.

2.6.2.1.3 Full Member Groups

Full member groups are those having signed a Memorandum of Understanding with the Project Management. They have to be approved by the Collaboration Board. They have the duty of contributing (in kind or fund) to the detector and of operating it once built. They have direct access to raw data and are entitled to sign Auger papers and to present Auger results in conferences on behalf of the Collaboration in agreement with the authorship rules included in the bylaws. Only groups from a full member country can have the status of a full member group.

2.6.2.1.4 Associate Groups

Under special circumstances groups may associate with full member groups. They have to be approved by the Collaboration Board. Members of the associate groups have the same responsibilities, duties and rights as members of full member groups.

2.6.2.1.5 Auger Collaboration Honorary member

Auger Collaboration Honorary Member is a special status reserved for members of P. Auger Collaboration whose contribution to Auger project goes beyond science and could be granted only to senior members at the occasion when they leave the collaboration or when they retire.
The status brings also some benefices such as:

- Access to Auger data
- Access to Auger meetings
- Work in Auger analysis
- Work in R&D and technical projects
- Access (full or limited) to Auger authorship

Candidates for Auger Collaboration Honorary Members can be nominated by all members of Auger Collaboration through their country representatives. The decision is brought by Collaboration Board which also grants the title to the selected person.

2.6.2.2 Rules of Membership

- Each institution having at least three participating physicists and/or engineers will have one representative on the CB.

- Full members of the Pierre Auger Collaboration are those institutions that have signed a MOU with the Collaboration as specified in the Project Management Plan, and approved by the CB with a simple majority.

- On August 1, 2000 or
- When one half of the present members will have singed the MOU's

    - Physicists or engineers, supported by their home institutions, who devote a reasonable amount of their time to the progress of the project and/or the running of the experiment, are considered as participating persons. The CB will be regularly informed (by oral or written reports) on the desired or actual activities of the persons participating in the project.

    - If institutions from one country do not qualify to have one representative, a group of two or three such institutions is allowed to have one representative.

    - Each participating country shall have at least one representative, even if they have less than three physicists or engineers.

    - Any project or experiment not directly involved with the Auger project but which uses or intends to use the Auger Observatory as a facility may have one representative as non-voting members of the CB.

    - The responsibility for selecting a representative lies with the institution or institutions involved.

    - The project spokesperson and co-spokesperson, the site spokespersons, the project manager and the task managers are, ex-officio, non-voting members of the CB.

- Exceptions to the membership rules are to be agreed by the CB after a vote.

2.6.3 Organization and Duties (Revised 26-JUN-2001)

- The CB will vote on admission of new member institutions to the collaboration.
- Each institutional or country representative will have one vote on the CB. If a CB member is unable to attend a meeting, a substitute may replace him/her.
- The chairperson and the secretary of the CB are elected by the CB to a renewable two-year term.
- The Auger Project spokesperson, co-spokesperson and project manager are elected by the Collaboration Board.
- The Task Leaders are proposed by the project spokesperson, co-spokesperson and project manager and their nomination approved by the CB.
- The site spokesperson and site managers and will be proposed by the two host countries. Their appointment will be ratified by the CB.

2.6.4 Meetings

The CB will meet at least twice a year.
A special meeting can be convened at any time on the instigation of at least one third of the CB members or of the spokesperson and co-spokesperson of the collaboration.

2.6.5 Country Representatives

Each participating country nominates a country representative. With respect to the collaboration, the country representatives are in charge of the transmission of information in both directions. They have also the task of collecting the votes for their countries whenever a vote is submitted to the collaboration as a whole.

2.6.6 Elections

Elected offices include Spokesperson, Co-Spokesperson, CB Chair, CB Co-Chair, and any other positions that might be designated by the CB for election. (Note: The office of "CB Co-Chair" is another name for what was formerly called the "CB Secretary".)
The procedures described here apply to all elections. Any collaboration member is eligible to be a collaboration officer.

Elections for CB Chair and CB Co-Chair will be organized by the Collaboration Spokesperson(s). All other elections will be organized by the CB Chair. The election organizer may

delegate that responsibility to another collaboration member.

Candidates for an office are recommended by a search committee. The search committee consults the CB and other collaboration members of their choosing before recommending a set of viable candidates (not more than 3 for a single office). Any collaboration member may nominate officer candidates to the search committee.

The CB selects the chairperson for the search committee. The committee chairperson chooses 4 additional members and notifies the CB of this choice. The CB approves or disapproves the entire committee. The election organizer informs the collaboration of the candidates recommended by the search committee. The candidates are expected to submit a written statement to the election organizer, and the organizer makes those statements available to the collaboration. These election preparations should be completed at least two weeks prior to the election to allow time for home institutions to deliberate how their CB representatives should vote.

Voting is done by secret ballot during a meeting of the CB. In extraordinary circumstances, elections can be held by email or other means, and the election organizer is then responsible for protecting the privacy of the voting. A quorum of CB representatives is required for a valid election.

The candidate receiving more than 50% of the cast ballots is elected. If no candidate receives more than 50%, the candidate with the fewest votes is eliminated and another round of voting takes place. If only one candidate is recommended, CB members vote on whether they accept the candidate by a majority of yes/no votes.

All elections are documented in the minutes of the CB. The information recorded includes the candidate names and the results of each round of voting without numerical totals. Normally, modified rules cannot be applied to elections at the same CB meeting. These election rules were approved by the CB on November 20, 2003.

2.7 Standing Committees

2.7.1 Definition

A series of standing committees will be appointed to deal with issues that impact the collaboration as a whole. The duties of the standing committees will typically extend through the duration of the project. The members are appointed by the Project Spokesperson and ratified by the Collaboration Board. Members of these committees will serve indefinite terms.

2.7.2 Publications Committee

The Publications Committee is responsible for proposing and maintaining a set of rules for the release of data to the outside world (see Section 12 .0). The Publications Committee has four members and a chairperson. Spokespersons are members of the Publications Committee ex-officio. Members of the Publications Committee are appointed by the Collaboration Board and serve

renewable 3-year terms. The establishment and revision of the publications policies are subject to Collaboration Board approval.

3 Project Task Descriptions (revised 31 August 1998)

3.1 Definition

The following are descriptions of the responsibilities of each Task Group.

3.2 Fluorescence Detectors

1. Optics.
   Includes mirrors, filters, Schmidt correction plate (if used) and the camera focal surface.
2. Mechanical.
   Includes mirror mounts, detection structure and enclosures.
3. Calibration.
4. Atmospheric monitoring.
5. Prototypes.
6. Integration.

3.3 Fluorescence Detector Electronics

1. High and low voltage supplies, power distribution and cabling.
2. PMT's and bases - specification, procurement and test.
3. Analog pixel electronics.
4. Digital pixel electronics.
5. Low and high level triggers.
6. Integration.

3.4 Surface Detectors

1. Tanks.
2. Tank liners.
3. PMT enclosures.
4. Solar power (up to the power converter).
5. Mechanical integration.
6. Water specification/conditioning.
7. Deployment.
8. Scintillation detector Upgrade

3.5 Surface Detector Electronics (revised 2/1/99)

1. Base/preamp/HV.
2. Front end/FADC.
3. Station controller.

4. GPS interface.
5. GPS receiver and antenna.
6. Control and monitoring.
7. Communications processor.

8. Packaging/thermal.
9. Mother board/power conversion.
10. Integration/testing.
11. Electronics and trigger simulation.
12. Signal and power interconnections.
13. Photomultiplier Tubes

3.6 Communications

1. Antennas (for equipment on each tank).
2. Capillary network.
3. Concentrators and fluorescence links.
4. Protocol.

3.7 Central Data Acquisition System

1. Central trigger formation and data request.
2. Run control.
3. Event building.
4. Monitoring.
5. Slow control.
6. Alarm system.

3.8 Data Processing and Analysis (Revised 22-MAY-2001)

1. Software standards definition -
   This is the coordination of the intra tasks group responsible for the definitions of software standards and validation of ``official'' Auger software.
2. Data format definition -
   This is the definition of interfaces between the different data analysis stages.
   It tells the simulation people what they must handle to the analysis
   Programs.
3. Data processing (reconstruction) -
   Coordination of work of people doing the reconstruction of events and insuring that the best algorithms get into the central reconstruction software (on which papers should be based).
   Fast reconstruction for use in the analysis of the quality of data collected.
4. Data storage, distribution and bookkeeping -
   Where and how the Master Data ``Tapes'' should be kept, making copies available to people doing analysis, keeping track of different stages and versions of the data reconstruction.
5. Database management -

This is a hybrid task, once the database should be defined by the CDAS, but this task is the main client of it. How it is made available to people analyzing the data, keeping track of versions and all that would be the responsibility of this task.

6. Data and simulation coherence -
   Interface with the simulation (of detectors and showers) groups to insure that real data feed the quality of the simulation.
7. Software environment -
   Maintenance of a software library and a homogeneous environment for people doing analysis.
8. Analysis tools -
   Collecting and making available to the whole collaboration the tools developed for analysis.

3.9 Performance Monitoring (Revised 8-May-2013)

1. Monitor detector performance (reference performance metrics)
2. Monitor the quality of all the data flows
3. Monitor the acquisition status (CDAS, Comms, Local Stations) and Provide alarms for Local Stations

3.10 Education/Outreach

Basic scientific research such as what we propose with the Pierre Auger Project depends on public support. Informing the public of our project, it's objectives and results is therefore an important obligation. Sharing the excitement of scientific inquiry and discovery particularly with young people will help insure the vitality of scientific research in the future.

The responsibilities of the education task group are as follows:

1. Establish and maintain education/visitors centers in each of the sites. These centers would have exhibits and demonstrations which explain the objectives of the Auger Project and related science.
2. Prepare news releases when project milestones are reached. For maximum effectiveness group members for each country should develop and maintain close contact with science writers. This is especially important for communities near the detector sites.
3. Maintain information like the Auger press kit for distribution to the press, schools and interested public.
4. Prepare and maintain a file of photographic and graphics related to the Auger Project to be a resource for the press and for Auger collaborators preparing talks.
5. Maintain interesting and informative Web sites for access by those interested in the Auger Project.
6. Work with the communities and local authorities near the sites to help maintain good relations.
7. Coordinate responses to requests for talks at seminars, colloquia, conferences, etc.
8. Search for sponsors for the Auger Project.

3.11 Data Release (30-MAR-15)

Development of a web portal and other tools to provide access to Auger Data as outlined in the data release policy approved by the Collaboration Board. Participate in future developments of the data release policy.

3.13 SSD: Scintillator Surface Detectors
- scintillators, optical fibers
- casing and support structures
- photo-detectors and accessories
- cabling and connectors

3.14 AMIGA: Amiga Underground detectors
- scintillators and optical fibers
- AMIGA photodetectors
- casing, access tubes, support stuctures
- AMIGA underground electronics kits, AMIGA surface electronics, cabling, connectors
- AMIGA power supply
- AMIGA dedicated comms system

3.15 AERA: AERA radio detection systems
- Antennas and receivers
- AERA electronics and DAQ
- Masts, support structures, casings, fences
- AERA power supply
- AERA dedicated comms system

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4 Cost Estimation, Tracking and Control

4.1 Cost Estimation Procedure (revised 1/6/99)

4.1.1 Introduction

The most important tool for project definition, cost control and tracking is the Work Breakdown Structure. The success of the Auger Project depends critically on the care in which the WBS is prepared and used.

4.1.2 Purpose of these Procedures

These procedures are intended to guide the task leaders in the Pierre Auger Project in developing project cost estimates. The purpose is to provide a common approach and framework for cost estimates among all subsystems and to produce a comprehensive, accurate, and defensible cost estimate.

The cost estimates will be organized using a work breakdown structure (WBS) format. It is intended that each of the task leaders and, in turn, the subtask leader's supply the details of the WBS for their subsystem subject to these guidelines.

The steps of the WBS and cost estimate development, described in the following sections, are:

1. Develop a list of all components and tasks, organized by subsystem, that constitute the work to complete the project. Each component and task is a WBS element.
2. Estimate the cost of the components and activities which comprise the lowest level of the WBS and complete the basis of estimate document for such activities.
3. Complete the WBS dictionary and cost basis for each WBS element.

4.1.3 Organization of Cost Estimation Effort

Guidelines for WBS Development

1. WBS Elements and Activities

Generally the first three levels of the WBS elements are deliverables and for the most part are described as nouns. Descending levels provide an increasingly detailed definition of the top element. The number of levels depends on the scope and complexity of the individual project and the degree of control it warrants. The activities, such as engineering design procurement, appear at the lowest level of the WBS.

2. Assembly, Installation, Test and Project Management
   The only exceptions to the above rule regarding the highest level are subsystem assembly, installation, system integration and test, and project management.

   a) Subsystem Assembly
   Subsystem assembly is the activity of putting together all subsystem components. Without it, the sum of the pieces does not equal the whole.

   b) Installation
   Installation is the act of putting the subsystems together at the detector site.

   c) System Tests
   System tests are those tests performed after the assembly activities.

3. WBS Numbers

WBS elements will be numbered in the classical dotted decimal format. The first level of the WBS corresponds to the Pierre Auger Project major systems; the second level to the major components.

4.2 Cost Estimation

4.2.1 Cost Estimation Approach and Responsibilities

The Pierre Auger Project is composed of a number of subsystem task groups, each of which will be required to develop a cost estimate. The Task Leaders will have the responsibility for developing cost estimates in a manner consistent with the Pierre Auger Project approach outlined in the following sections.

4.2.2 WBS Dictionary and Basis of Estimate

A WBS dictionary and basis of cost is shown in Table 1.

4.2.3 Cost Estimation Guidelines

1. Cost Estimate Basis

   The basis for the cost estimate developed according to these procedures will be a detailed bottoms-up estimate for each task group.

2. Base Year

   Cost estimates will be in the FY96 US dollars.

3. Detector Configuration

   Costs will be based on the base line design resulting from the Auger Project Performance Requirements and Technical Specifications.

4. Cost Estimates

   Cost estimates should be developed according to the WBS format shown in Table 2. The rows are the WBS hierarchy which includes all subsystems and divides each into multiple levels of component parts. The columns define the labor and materials required for each WBS element.

5. Cost Book

   In addition to developing a WBS each Task Leader should develop a cost book. This document will contain supporting information such as vendor quotes, invoices from previous procurements, and catalogue page copies, and will summarize the philosophy and parameters used to prepare the cost detailed items. This information will be used for both internal and external reviews of the system costs.

WBS Number	
WBS Name	

WBS Definition	Identify included components Interface with other elements Drawing references List of key parameters Key technical issues
Basis of Estimate	A brief description of how the estimate was made.

Table 2: WBS Dictionary and Basis of Estimate

4.3 Labor Costs

4.3.1 Classifications

Six labor categories have been identified for the completion of labor cost estimates. They are:

- P Physicist
- E Engineer
- D Designer
- T Technician
- L Labor
- C Clerical

4.3.2 Labor Codes

Labor codes will be constructed from the above category codes by appending a single letter, in "dotted" format, to identify the institution/funding source, followed by a letter to identify the labor type.

To identify the specific institution where the labor will take place institution codes will be defined so the appropriate labor rate can be applied. Each of the above labor classifications may be in support of manufacturing or non-manufacturing (EDIA) activities. A suffix or ".M" will be added to the above labor classification to denote manufacturing activities, a suffix or ".E" will denote EDIA.

4.3.3 Labor Rates

Initially all labor rates will be generic. Labor rates may need to be established for the institutions at which significant labor will be performed. For others, generic labor rates may be used. In determining which labor rates to use, the cost estimator needs to determine where the work will be performed, and to use the most accurate information available regarding the labor rates for that institution. All assumptions should be clearly stated in the cost book.

The labor rates should be fully burdened with associated costs. Typically a burdened labor rate includes direct labor, fringe, overhead, vacation, sick leave, and general and administrative costs.

Often labor estimates do not include all labor associated with manufacturing a product (e.g., manufacturing support, facility maintenance, etc.) because some of this effort is included in the overhead rate for that institution. A description of what is included in overhead at a given location should be provided.

4.3.4 Calendar and Time Units

A standard calendar of 250 days/year, based on 8 hours/day, 5 days/week, 10 holidays/year, which equates to 2000 hours/year, will be used for all activities. The standard unit of time will be the day.

4.3.5 Material Costs

Material costs include the purchase of raw materials for fabrication and the procurement of components, subassemblies, and tooling from outside sources, or items estimated in such a way that only a total dollar amount can be identified. This includes detector hardware, equipment, fixtures, tooling, utilities, test and assembly equipment, computer hardware and software, raw materials, and procurement processing. Travel is considered a material cost. The cost book should indicate the basis for arriving at the materials cost estimate.

4.3.6 Contingency Analysis (Revised 22-MAY-2001)

Procedures

1. Base Cost Estimate

The base cost estimate is the estimated cost of doing things correctly the first time, unless from past experience you are fairly certain that it will take more than once. In other words, contingency should not be included in the base cost.

2. Cost Contingency

Cost contingency is the amount of additional money, above and beyond the base cost, that is required to ensure the project's success. This money is to be used only for omissions and the unexpected difficulties that may arise. Contingency is held entirely by Pierre Auger Project management and not by individual subsystem managers. Contingency costs are explicitly part of the total cost estimate.

3. Contingency Estimation for the WBS

The procedure for estimating cost contingency is assigned as follows:

Contingency Assignment

Source of Estimate	Percent Contingency
Vendor Quote	10%
Vendor Information	20%

Engineering Estimate	30%
Physicist Estimate	50%

4.4 Cost Tracking (Revised 22-MAY-2001

The Auger Cost and Schedule Officer is responsible for assisting the Project Manager in tracking costs and progress in building or upgrading the Auger Observatory. The principal tools for tracking cost are the Auger Work Breakdown Structure and the Project Schedule.

Each institution will make commitments for deliverables to the project by way of the Memoranda of Understanding (see Section 2.1.5). Each country and the institutions within that country make commitments for deliverables with resources available within that country. Each institution will then report on a monthly basis to the Task Leaders of the earned value and task percentages complete by WBS element. The Task Leaders will in turn report progress to the Project Cost and Schedule Officer at WBS level 7 and above. The Cost and Schedule Officer will prepare reports for the Project Manager, Spokesperson, Collaboration and Finance Board. The Cost and Schedule Officer will flag deviation from the project plan for corrective action by the Project Manager.

5 Schedule Tracking and Control (Revised 24-SEP-1998)

The Pierre Auger Project Work Breakdown Structure will be basis for the project schedule. Each task will be broken up into a suitable number of intervals or subtasks and milestones to allow effective tracking. The schedule on the overall project will be build into one of the popular scheduling tools such as Microsoft Project or Primavera Project Planner.

Each Task Leader will be responsible for tracking scheduled activities within his/her own task using the same scheduling tool. Progress reports from the Task Leaders will be at the WBS level 4 and higher will be transmitted to the Project Cost and Schedule Officer on a monthly basis.

The Cost and Schedule Officer will, in turn, prepare progress reports for use by the Spokesperson, Project Manager, Collaboration Board and Finance Board.

6 Project Reviews (Revised 28-AUG-1998)

6.1 Introduction

Three major internal reviews are required for each detector subsystem both for construction and subsequent upgrades. Depending on scheduling constraints these components may be broken-down into subcomponents. Other less formal reviews may be instituted by the Project Manager as required.

6.2 Preliminary Design Review (PDR)

The Preliminary Design Review is conducted to:

1. Evaluate the progress, technical adequacy, and risk resolution (on a technical, cost and schedule basis) of the selected design approach.

2. Evaluate plans and preliminary assessments of design capability to fulfill performance and engineering requirements as well as reliability, maintainability, supportability, quality and safety.

3. Review the cost and schedule of the proposed design.

Approval of the preliminary design will constitute approval to proceed with the detailed design.

6.3 Critical Design Review (CDR)

The Critical Design Review is used to establish the final production, assembly and installation designs. It will normally be implemented when the technical design is complete, preproduction prototypes have been evaluated, and pre-production is ready to begin.

6.4 Production Readiness Reviews

Subsequent to the Critical Design Review and before fabrication of components is started, a Production Readiness Review is held (at the production site if practical). The review covers work procedures, the quality plan, tooling readiness, packaging, shipping and production schedule.

6.5 Operations Readiness Reviews (Included 8-MAY-2013)

A subsystem only becomes part the operation of the Observatory when it has passed an Operations Readiness Review. This review ensures that the subsystem is in effective, stable operation, all documentation has been filed, spares are available and the staff has been trained.

7 Observatory Operations(Revised 6-NOV-1998)

7.1 Financing Observatory Operations (Version 0.14 16 March 2011)

This document describes the procedures for financing the operation of the Pierre Auger Observatory. The Pierre Auger Observatory is built and operated by an international collaboration. The costs of operating the Observatory are shared among the collaborating countries.

Operations Cost List

- Cost sharing is based on an "Operations Cost List (OCL)". This is a list of persons, excluding students, from each country who are eligible to be authors of scientific papers.
- The Operations Cost List is updated annually. A new OCL is produced each year in August. This serves as the OCL for the year following. The OCL compiled in August of Year Y - 1 is called the Year Y OCL. A person located temporarily in another institution will be counted with that institution and will be listed as "on leave" from their home institution.

Cost Sharing

- After each year is over and when final costs are available, each participating country is assigned a share of the actual costs, based on its fraction of authors on the OCL.
- The OCL used for these cost assignments is the one compiled in August of the year preceding the year of the costs. The Year Y costs are distributed according to the Year Y OCL (compiled in August of Year Y-1).
- Argentina's contributions thus far have been "in-kind" rather than direct transfer of funds. The amount of the in-kind contribution from Argentina is reviewed annually by the project management team.

Operations and Severance Reserve

- The Auger Finance Board has agreed that the Observatory should maintain a reserve equal to the cost of operating the Observatory for six months. Each country was asked to pay its share of part of the reserve (30% of the cost of one year's operation) in 2006. In 2007, the full reserve amount was due (50% of the cost of one year of operation).. After 2007, the reserve assessment is the incremental amount needed to keep the reserve at 50% of the cost of one year of operation.
- At the 30 November 2007 meeting of the Auger Finance Board, the Finance Board agreed that the Observatory should maintain a fund for severance pay for employees in addition to the six-month operating reserve. Severance pay is required by law in Argentina. The amount required for the severance fund is calculated at the end of the year when final assessments are being prepared.

Estimates and Assessments

- Each year, the project management team estimates Observatory operations costs based on past experience, exchange rate projections and expected inflation and prepares a budget for the following year. The proposed budget, based on these operating cost estimates, is presented for approval to the Finance Board at their meeting in September.
- The approved budget together with the reserve increment constitutes the total assessment for the following year. Funding requests to the collaborating countries for the following year are determined by using the OCL from August and distributed following the Finance Board meeting in September. Any funds owed from the current or previous years will be noted at the same time.
- At the end of the year a table will be distributed that contains an updated balance of costs and contributions from 2001 through the current year.
- Estimates for future years are provided as guidelines to assist countries in their financial planning and interactions with their funding agencies. A country's actual cost share may be different from its assessment in a particular year for many reasons, including:
    - Actual costs differ from estimated costs.
    - Peso/dollar exchange rate may change.
    - A country's author fraction may change.
- It is important for countries to pay their assessments as soon as possible to maintain smooth operation of the Observatory.

Contribution Status

- A country will be considered "in good standing" if it has paid its share of operations costs, including the reserve and severance, for all previous years. No later than March 31 of each year, the project manager will communicate to the Country Representatives the status of contributions to the operating costs by all Auger countries. This status report will include all years of Auger operation through the year just completed. It will include actual operating costs if they are available, but the operating costs for the year immediately preceding may be an estimate, based on a projection. It will include all contributions received and credited as of the report date.
- If a country's total cost share (for all completed years, including reserve and severance) exceeds its contributions, that country will be informed that it must pay its share of costs through the preceding year by 30 June of the current year. If the country fails to do so, its authors (exclusive of students and postdocs) shall be excluded from papers published by the collaboration, as of 1 July. The country's authors will return to the author list after its financial obligation is met. The Finance Board has agreed to assist in implementing this provision.
- A country's cost share for a particular year will be different from its assessment. It may be larger or smaller. Countries are responsible for contributing an amount greater than or equal to their cost shares, including maintaining the reserve for Operations and severance.
- If a country is unable to meet its obligations, the project manager will bring this to the attention of the spokespersons and the Finance Board.

New Countries

- New countries may join the collaboration at any time during the year. After a country is accepted into the collaboration, it becomes responsible for contributing to Operations.
- New countries will have an operating assessment for the year in which they become collaborators. This assessment will be determined by the fraction of the year remaining after their approval by the Collaboration Board.
- If a new country joins in the first half of the year, before mid-year assessments for the following year are distributed, the new country will be added to the current Operations Cost List and an assessment for the following year calculated for it in the usual way.
- If a new country joins in the second half of the year, it will be added to the new OCL in August and will thus receive an assessment when final assessments are sent out in September.

7.2 Project Life Cycle Subsystem Maintenance

Each institution shall undertake to provide a comprehensive subsystem maintenance package, SMP, for each subsystem contributed to the project. The SMP shall include technical design documentation, test equipment (1), test procedures and instruction manuals as appropriate to the maintenance and fault diagnosis requirements of the subsystem. The SMP shall be sufficiently detailed and comprehensive so as to permit suitably qualified non-Institution maintenance staff to maintain the effective operation of the subsystem after appropriate training in the use of the SMP. The SMP shall be considered part of the subsystem deliverables and will be subject to the same technical review and acceptance procedures (2). This provision is intended to ensure that sufficient

maintenance capabilities are available for every subsystem over the planned 20 year project life cycle.

1. SMP test equipment will form part of the Observatory maintenance facility and individual items of general purpose test equipment will be shared with the SMP's for other sub-systems.

2. To this end, the design of the SMP should be considered in parallel with the design of the subsystem itself.

7.3 Decommissioning (28-JAN-2013)

Decommissioning plans have been developed for the time when the Observatory will be closed. The largest component of the decommissioning process is expected to be the retrieval and disposal of the surface detector stations. While it is possible that some landowners may wish to keep the tanks for their own purposes, our assumption is that all detectors must be retrieved. Once the surface detectors have been returned to the central campus, they will be disassembled and the majority of components can be sold as scrap for recycling.

The Los Leones, Los Morados, Loma Amarilla, and all central campus buildings will all become property of the Province of Mendoza. The Coihueco building will either be negotiated for sale or donated to Nieves Argentinas, the landowner of the Coiheuco site. All buildings will be razed if necessary.

A key issue related to decommissioning is ownership of materials. Each institution likely has their own methods of divesting assets and if any institution wishes to reclaim any components, the institution needs to notify project management well in advance of decommissioning.

The Auger International Agreement details the funding plan for decommissioning.

8 Configuration Control and Change Management (Revised 28-AUG-1998)

The Configuration Control Board meets to consider changes to the Auger Observatory including engineering drawings, requirements and specifications. The Configuration Control board will evaluate and determine the impact of proposed changes on the technical objectives of the project. If the changes impact the science objectives of the project they will be referred to the Project Spokesperson and the collaboration.

The Auger Configuration Control Board is made up of the Task Managers, the Quality Assurance Officer, the System Engineer, the Cost Schedule Officer and others as appointed by the Project Manager. The Project Manager serves as chair of the Configuration Control Board.

9 Document Control (Revised 28-JAN-2015)

The policy of the Auger Project (including upgrade) is to maintain adequate documentation and data to ensure that the project purpose is fulfilled, while recognizing the objective of minimizing paperwork and cost.

A controlled document is a document which is subject to change, and the most current version is necessary for successful operation. Typical controlled documents include project plans, specifications and engineering documents. A list of controlled documents maintained by the project is found in section 4.5 of the project Quality Assurance Plan.

Controlled documents and data are created, implemented, and maintained at a level commensurate with the level of work being performed. In general, each Task Group is responsible for controlling the documents and data that relate to the tasks under their domain. Controlled documents and data are reviewed approved by authorized personnel prior to issue, and authorized personnel are defined for each document that is controlled. The flowchart below describes the process used to control documentation.

9.1 Engineering Documents

Engineering documents include mechanical drawings, electrical schematics, logic diagrams and electronic circuit board layouts. Engineering documents are controlled using an electronic document management system.

The document management system (currently the CERN EDMS) will be evolutionary. Through the construction phase of the Observatory, the native file data for engineering documents will be maintained at the generating institution. Copies of the released drawings will be stored in a standard format (i.e PDF) in at the electronic document management system

Engineering documents are reviewed and approved at the generating institution, i.e. formal review of drawings is done within the local institutions. As the construction process of the Southern Observatory develops, the project will shift from mostly local institution review of drawings, to a more global project review process. That is, people outside the local institution will do formal reviews of drawings.

10 Quality Assurance (Revised 11-JUN-2001)

Quality Assurance is an integral part of the construction and operations of the Auger Observatory. The Pierre Auger Quality Assurance Plan describes the policies and procedures for assuring the performance and reliability of the detector systems for the Pierre Auger Observatory. The Project Quality Assurance Plan is formatted using the guidelines defined by ISO9001:1994

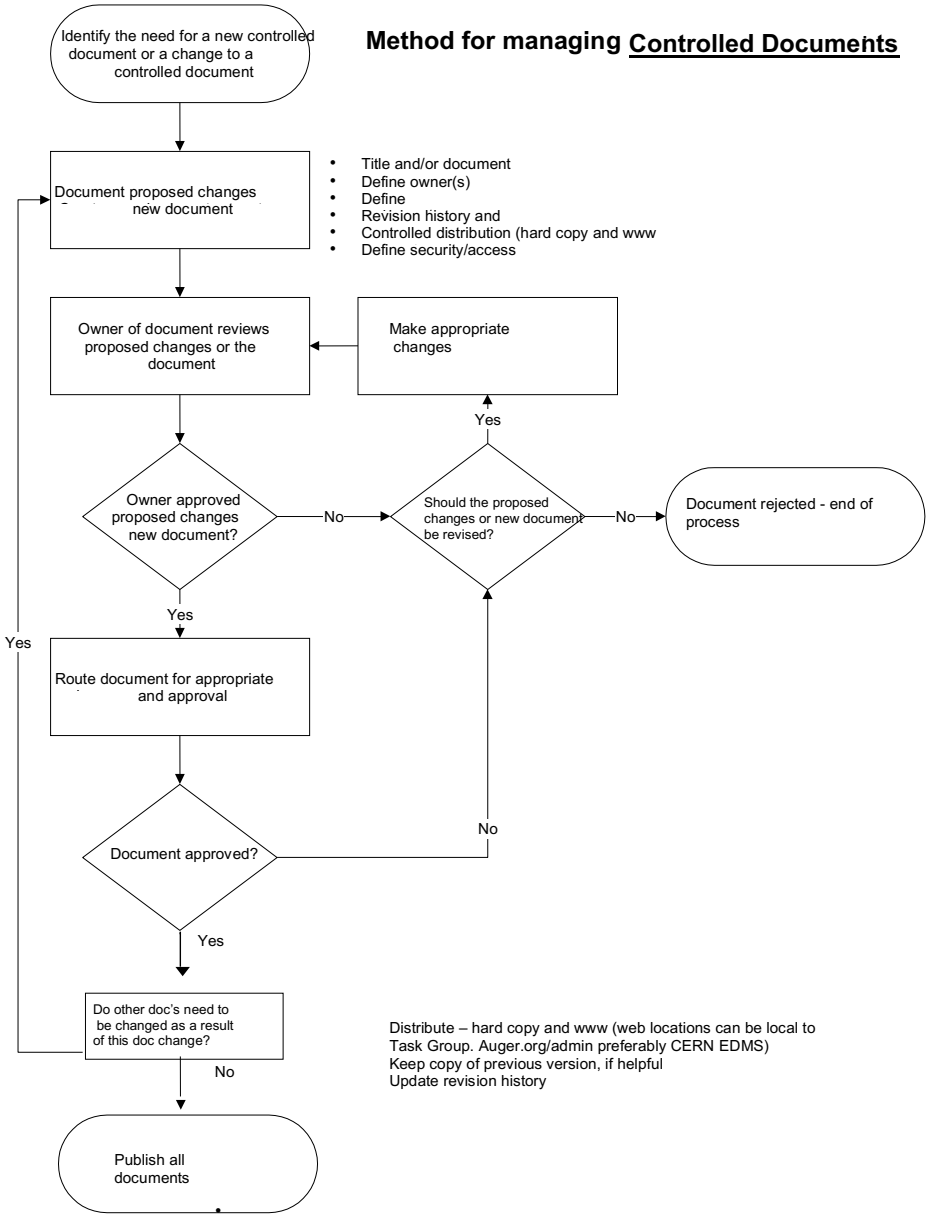
Each Task Leader is responsible for applying the quality assurance requirements stated in the project's Quality Assurance Plan to the products and services of the group that they represent. The Project Manager and Project Quality Assurance Officer will review each group's method of addressing quality assurance prior to implementation.

Project members are encouraged to incorporate familiar and time-proven methods when addressing the 10 Quality Assurance Criteria of the project's Quality Assurance Plan. In this way the project

will benefit from many of the long established quality practices previously established within each group or subsystem.

Each Task Group's approach to address the project's Quality Assurance requirements must be documented and submitted for approval. Each group's quality system may be submitted as a formal Quality Assurance Plan, or a substitute method of conveying adherence the project's Quality Assurance Plan may also be submitted for approval. The Project Quality Assurance Officer can assist each group in attaining their quality go

Method for managing Controlled Documents



Distribute – hard copy and www (web locations can be local to Task Group. Auger.org/admin preferably CERN EDMS)
Keep copy of previous version, if helpful
Update revision history

11 Project Communications (Revised 28-AUG-1998)

The World Wide Web will be the primary tool for communications among the collaboration on the Auger Project. This Web location (auger.org/admin) will contain material on public relations, education and Project Management. Project Management information on the Web will include:

- Organization
- Performance Requirements and Technical Specifications
- Access to the Engineering Drawing Database
- Technical and scientific notes (GAP Notes)
- Electronic log book
- The Pierre Auger Project Design Report
- Technical Design Report
- Calendar of events
- Action items
- Progress reports
- Travelers

12 Publications and Authorship Policy (MAY-2003)

12.1 Introduction

Scientific data coming from the Pierre Auger Observatory will be communicated to the outside world. The data and possibly their interpretation, may be released through the use of different media: seminars, conference talks, articles in scientific journals, notes and public release on the Web, press releases, etc.

It is important that the Pierre Auger Collaboration has a set of rules approved by the Collaboration Board, which are followed as standard procedures for data release to the outside world, thus avoiding internal contradictions or confusion which tend to impair the credibility of the data.

Two classes of data presentations are considered in this document:

1. The standard science paper to be submitted to a journal with referees. This is called "Paper Approval."
2. Conference co-ordination.

12.2 Paper Approval

Collaboration approval is required for any scientific paper and conference contribution intended for publication in a scientific journal or conference proceedings.

The procedures described in the following do not apply to review papers such as those published in Reviews of Modern Physics, Physical Reports, Annual Reviews, etc.

It is recommended that the paper drafts follow the Auger House Style prescriptions.

12.2.1 Editorial Board and First Draft

Proponents of a paper intended for a refereed journal, whose names usually arise naturally but who may be designated by the Spokespersons and/or Science Coordinators, request that an Editorial Board be appointed by the Publication Committee (PC) to help in the first drafting and final analysis coordination for the paper. The proponents (hereafter designated as Main Authors) can suggest the names of Auger collaborators who are knowledgeable in the appropriate subject matter, and the Editorial Board candidates will be considered and discussed by the PC and Main Authors, so that typically two Auger collaborators will be appointed. It is desirable but not mandatory that a Science Coordinator is one of designated members of the Editorial Board. The Main Authors plus the collaborators nominated by the PC will then constitute the Editorial Board for this paper, which will be responsible for its first draft. Once this is ready it is sent to the PC, and posted on the official PC Web page. The PC will then make the first review the draft and send comments to the MA for their consideration. In the case of changes, a new draft of the paper is sent to the PC and uploaded on the PC Web page.

12.2. 2 Official Readers, Review

At this time the PC will assign two Official Readers for the paper. These Official Readers are members of the Collaboration who did not work very closely with the writers of the paper in producing it, and act as internal referees. Their role is largely to be critical and to improve the paper and to steer it to final publication. Simultaneously to the review by the Official Readers, the paper is announced to the entire Auger Collaboration, and released for collaboration review. The time allowed for comments after announcing a draft for review will be no less than two weeks, and the deadline is announced for each draft by the PC.

Comments on the draft can be directed to the Editorial Board, preferably through the Web-based feedback system of the PC, so that they are archived and visible to all. Individual comments are welcome, but would preferably be consolidated and coordinated with those of others by institution, as far as possible, to minimize the volume of feedback and to avoid mutually contradictory comments and preferences (especially on fine points of stylistic preferences).

12.2.3 Revision Procedure

After receiving the comments from the Collaboration, the Editorial Board meets (possibly remotely) to discuss the comments and prepare the final version of the paper. The Official Readers can be consulted and encouraged to participate.

When necessary the same review procedure is repeated, again allowing a two week review. Most often but not always, the Main Authors will also be members of a particular Auger task. Any other members of the same task, who may not be amongst the group of Main Authors and Editorial

Board, will naturally be consulted and/or interested readers of the paper at various stages of drafting and proofing.

12.2.4 Plot Approval

All the plots, results and numbers in the final draft of the paper to be published should be approved by the task leaders, Analysis and Science Coordinators, Spokespersons and PC.

A collaborator who wants to show or use an unpublished plot/result has the right to do that, provided that he/she asks for the PC approval first. Usually the person first discusses with the relevant task leaders and analysis coordinators, and once he/she has their approval, he/she asks for that of the PC too. Alternatively, the person may ask first the PC, which in turn will contact the relevant task leaders, Analysis and Science Coordinators, and Spokesperson for an overall approval. Once the approval is warranted, a plot/result becomes “official” and may be included in papers as well as shown in conference presentations.

12.2.5 Submission to a journal

The Editorial Board (possibly in consultation with the Official Readers) will suggest a candidate journal for submission, which will be decided ultimately by consensus amongst the Editorial Board, the Spokespersons and the PC. Once convergence to a final draft has been achieved and the paper is declared "**approved for submission**", the Main Authors have the green light to proceed with the submission and to release the paper simultaneously to the arXiv if they believe it appropriate. This latter is recommended but not required (in particular, for some journals the release in preprint form may be embargoed).

When a paper is returned by a journal with referee comments, it is the continued responsibility of the Main Authors, working with the Editorial Board and Official Readers (in consultation with the PC) to address these comments and proceed with resubmission. All communications between the Main Authors and the journal editors should be made in consultation with the PC (who can help edit responses as needed).

12.2.6 Proceedings, Short Author List Papers, Auger-Related Papers

In the case of conference proceedings, an analogous procedure is followed, but without a designated Editorial Board or Official Readers (except for ICRC contributions, where new results have typically been coordinated by de facto Editorial Boards from the various Task Groups involved). In particular, it is mandatory to allocate a minimum of two weeks for PC and Collaboration review of any conference proceedings article, so that it is not acceptable to finish and attempt to submit a conference paper within a few days of the deadline. In the case of short-author list articles on Auger and its science and techniques, the same procedure is followed, but the PC may request that the paper authorship be augmented to include the whole Collaboration.

In the case of papers (journal or proceedings) written by a subset of the Auger Collaboration, on Auger-related topics, the PC requires being informed of the article and be provided a draft, with sufficient time to review and comment (usually the same two-week deadline). With this procedure

the article can often benefit from comments and suggestions by the Auger PC, who will ensure at the minimum that any references to Auger are complete and accurate, and that appropriate acknowledgments to Auger are made.

Full Auger proceedings are posted on the PC Web site and are made available to the entire Collaboration for review and comments during a period of one week. Short-author-list papers are also posted on the PC Web site and made available to the Institutional Representatives for review and comments during a period of one week.

For a short-author-list paper and under justified circumstances there is an option for the author(s) to ask the PC for confidentiality in their review. If the request of confidentiality is accepted by the PC, the paper will not be released for review by the Institutional Representatives.

12.3 Conference co-ordination

The Spokesperson should propose and the *Collaboration Board* should appoint a *Conference Committee* who will designate the speakers who will present results, on behalf of the Collaboration, in international conferences.

The Conference Committee is responsible for arranging the list of conferences at which the Auger Collaboration communicates its technical and scientific achievements. It is also in charge of nominating the speakers that represent the Auger Collaboration at those international conferences. The Conference Committee is composed of four members, acting one of them as the chair-person. Members of the Conference Committee are appointed by the Collaboration Board and serve renewable 3-year term.

The co-ordination should normally take place in December for the conferences in next calendar year. Designation of speakers for the conferences, where there was no information in December, can be done on event by event basis. Each *Collaboration Board Representative* should propose speakers from his institution by sending a request accompanying by a short abstract to the *Conference Committee*.

Talks on international conferences, particularly those presented by young members of the Collaboration (PhD students and postdocs) should be rehearsed. It is the responsibility of the speaker's home institution to organize a rehearsal as a regular seminar within their department of laboratory.

Presentations in conferences and corresponding papers for the proceedings may only include plots and results that have been previously published by the Collaboration in journal papers or else been previously approved as mentioned in Section 12.2.4. The ICRC presentations and corresponding papers represent an exception to this procedure, and new plots and results may be shown by the presenter at these conferences.

12.4 Criteria for Authorship of the Pierre Auger Observatory Papers

It is the responsibility of the *Collaboration Board Representative* of a given institution to maintain a list of the members of his/her institution who to the best of his judgment should be on the author's list of the Collaboration's papers. However some criteria should be followed:

1. It is desirable that a new member has spent a minimum of six months in the collaboration before starting signing papers, unless, of course, he or she is one of the initiating authors of the paper or has significantly contributed, during the period of time inferior to six months, to the scientific objectives and achievements of the Pierre Auger Observatory.

2. The number of authors signing a paper will most likely be larger than the number of authors (called above "writers") initiating a paper. The *Collaboration Board Representative* of a given institution must take into account past and present contributions of the members of his institution to software, hardware and running of the Pierre Auger Observatories in order to compose the Institution's list of authors.

3. The *Collaboration Board Representative* should prepare a written document detailing the contribution being made by the listed individuals from his/her institution(s).

4. If a person leaves the Collaboration his/her name will appear on the author's list for some time, typically 12 months, after which the *Collaboration Board Representative* must send a written statement justifying the maintenance of that person's name on the list.

Changes in the Pierre Auger author list must be approved by the *Spokesperson*.

Technical papers may have a shorter author list coordinated by the *Publication Committee* in consultation with the *Task leader*. Further details on criteria for short-author list papers are found below in the section on Authorship of Short-Author List Papers.

Conference contributions should be signed by the presenter of the talk followed by “for the Pierre Auger Collaboration” and the entire Pierre Auger author list should be included in the proceedings whenever possible or a link to the current author list located at http://www.auger.org/archive/ or another suitable URL should be given.

12.5 Authorship of Short Author List Papers (*Revised 18 May 2011)*

The purpose of the Auger Project is to create new knowledge in Physics. This is accomplished by employing hardware techniques, analysis methods, software systems, physical theories, and phenomenological models. Each of those elements has parts that may be new or may have been known already. The specific combination of all of the parts is unique and is new.

We have joined together in a Collaboration to share what each of us knows with each other, in order to achieve our common goals. The outcome is a unique new scientific endeavor. The Collaboration is more than the sum of its parts.

Much of what each person brings to the Collaboration are things that they have learned, invented, or developed in the past. These include both technical skills and theoretical ideas. In addition, each of us learns new things while we work collaboratively. Such things always arise in part from the interactions we have with our collaborators. We share what we know and what we learn with our collaborators.

Therefore it is our practice to write papers presenting new knowledge in Physics with every collaborator included as a co-author. The rationale is that scientific results arising from analysis of Auger data could not have occurred without the contributions of everyone in the Collaboration. This practice is based on our experiences in earlier cosmic ray experiments and in high-energy physics experiments. It differs from the practice employed in astronomy.

We may permit some papers to be published that do not have the entire Collaboration as authors. These can be allowed if the specific topic is not about our primary physics work. That work includes identifying the sources and acceleration mechanism of cosmic rays, measuring the composition of cosmic rays, and studying characteristics of extensive air showers, especially aspects relating to high energy interactions.

There are two motivations for us to permit an author list that does not have the names of all collaborators. One is that we desire to find ways to highlight the contributions of individuals within the Collaboration to those outside of it, especially since the Collaboration is so large. The second reason is to share what we have learned about experimental techniques with members of the scientific community who are not part of our Collaboration.

The opportunity to publish papers without the full list of collaborators is limited. Members of the Collaboration do not have the same freedom to publish interpretations of Auger data as outsiders do. All members are expected to share fully their ideas and expertise with their collaborators in order to move our project forward. Ideas and expertise may be technical or theoretical, they may be newly developed or have been established before an individual joined the Collaboration. The data from the experiment represent the collective effort of all members. Interpretations of it must also stand as representations of the will and efforts of the Collaboration.

The difference between papers that require the full list of authors and those that do not is sometimes unclear. The distinguishing point is whether the paper uses Auger data to address the fundamental scientific mission of Auger. The decision to allow such papers is sometimes a subjective one. We have adopted certain guidelines to help us decide which papers are allowed to be published with a short list of authors.

These are:

1. Papers that make no use of published or unpublished Auger data.

2. Conference papers. The presenter may use only his or her name as the author, or a small group of names including those who have specifically performed the work in the presentation.

3. Review papers. Individuals who are invited by conferences or journals to write papers reviewing the field, including Auger results. They need do not need to add "for the Pierre Auger Collaboration" to their author line unless the paper is predominantly a review of Auger results.

4. Technical papers. Individuals or groups of people may write descriptions of specific hardware or software systems for journals like Nuclear Instruments and Methods. They must include all collaborators who have made serious contributions to such systems.

5. Theoretical or phenomenological papers that use Auger data to draw conclusions about scientific issues that are not deemed to be specifically or significantly among the main science target areas of Auger. These areas include cosmic ray sources, acceleration mechanisms, composition, or the characteristics of extensive air showers.

6. Papers using Auger data to describe a method or technique of analysis, but do not present conclusive or strong results on the main science target areas of Auger.

All papers using an incomplete author list should be shown to the Publication Committee (PC) before submission to a publisher. If the paper does not use any Auger data or results, then the PC will treat it as a "non Auger" paper. It will inspect it only to ensure that it presents Auger accurately: if so, the PC will directly give its approval to the author(s). All other papers with incomplete author lists must be approved by the PC and undergo the usual steps to approval. In addition, for these papers, the PC will ask for assurance from Institutional Representatives that the author list does not omit names of significant contributors to the work.

13 The Use of Raw Data by Members of the Pierre Auger Observatory

The raw data coming out of the Pierre Auger Observatory should be stored in a way that grants access to any member of the Pierre Auger Collaboration. There should be central depositories for the raw data, preferably located at the two sites, with one site keeping not only its own data but also data produced at the other site. Access has to be controlled assuring privacy of the raw data but otherwise any member of the collaboration can use her/his reconstruction code on the raw data in order to perform scientific data analysis. The reconstruction code used does not have to be declared official in order for a plot to be assessed by the collaboration. The burden of the proof concerning the soundness of a reconstruction code lies on the owner of that code.

These procedures can be changed by a majority vote of the Collaboration Board.

14 Extensions to the Pierre Auger Observatory beyond the Baseline Configuration

14.1 Preamble

The Pierre Auger Observatory for ultra-high energy cosmic rays consists of the baseline Observatory completed in June 2008 together with subsequent enhancements and upgrades.

14.2 Scope of this section

Changes to relatively small parts of the baseline design are handled by the Auger management through the Configuration Control and Change Management procedure. This document refers to proposed major design or configuration changes that will affect the entire observatory in science, operation and funding. These procedures can be changed by a majority vote of the Collaboration Board.

14.3 Definition of terms

The term *enhancements* is used for changes that aim to extend the observatory's present performance by additional instrumentation, where the functionality is basically known and the assets can be evaluated. The term *R&D* refers to changes that aim to develop novel techniques in the measurement and interpretation of cosmic rays. The term upgrade refers to a significant change in the configuration and physics sensitivity of the Observatory.

14.4 Procedure

Enhancements and R&D projects bear potential benefits and risks, which are of concern for the whole collaboration. A decision on their implementation is taken by the Collaboration Board (CB) in a five-step process: (1) proponents appeal to the CB for consideration of their proposal(s); (2) the CB classifies the proposal(s) as R&D or enhancement projects and notifies the Auger Finance Board; (3) the CB establishes one or more Assessment Committees in order to perform an in-depth assessment of the value and implications against predefined criteria; the set of criteria is part of the committee's charge and must be defined at this stage; committees may work in parallel and/or one committee may work on several proposals. (4) The CB receives a report by the Assessment Committee(s) and takes a decision. (5) The Auger Finance Board is asked for approval.

14.5 Criteria

The CB defines the set of criteria and adjusts their relative weights at stage (3) before a proposal is submitted and evaluated. Generic criteria and related questions for the evaluation of enhancement and R&D proposals are given in the following unordered list:

- Scientific worth: *Are the results going to give new and important insights? Is the proposal competitive internationally? Is it timely?*
- Expertise and competence: *Does the team assembled have the necessary expertise to carry out the proposed work? What is the track record of the team to deliver on the proposal?*
- Maturity of ideas: *Has the necessary research and development been done to realize the project?*
- Compatibility: *What is the impact on the work of the Southern and/or Northern Observatory? Is the project compatible with the existing deployment plan? What is the usage of Observatory resources?*
- Cost: *Are the funds sought adequate? Are there unfunded cost? What are the related Operating Cost for the Auger Observatory? Has the cost plan been checked by the Auger management?*
- Risks: *Have potential technical interferences been checked? Are there issues of land access? Is there any conflict with funding agencies?*

14.6 Assessment Committee

The CB appoints the chairperson of an Assessment Committee. The chair chooses the committee members in consultation with the CB chair, CB co-chair and spokespersons. The committee must comprise all the expertise required, which may vary with the nature of proposals being considered. CB members may request to amend the committee within a week after it's declaration.
The CB sets the time scale for the committee's work.

A typical committee task includes the request for precise, comprehensive written documentation from the proponents, the evaluation of the proposal(s) against the criteria, the delivery of a summary report to the CB and the formulation of a recommendation whether to accept or reject the proposal(s).

14.7 Transparent information

The entire proposal documentation and the Assessment Committee reports are to be made accessible by the whole collaboration, which is invited to comment at any time.

The Finance Board approves the enhancement procedure as amended above provided that when applied to real cases it is compatible with the FB's Rules of Procedure.

Appendix (Revised 8-MAY-2013)

A. Pierre Auger Project Collaborating Institutions, Collaborators, and Collaboration Board members

A Full list of current Auger collaborating Institutions and collaborators is found at:

http://www.auger.org/admin/Collaborators/Auger_collaborators.html

B. Pierre Auger Project Task Leaders/Subtask Leaders

The current list of Pierre Auger Project Task Leaders/Subtask Leaders may be found in: http://www.auger.org/admin/Whos_Who_JAN2013.pdf. This URL may change, but is accessible from www.auger.org/admin through the link *Organization (Who's Who)*.

C. Pierre Auger Project Memoranda of Understanding

The collection of Memoranda of Understanding for construction can be found at www.auger.org/admin/Management/MOU/mou_index.html

The collection of Memoranda of understanding for Operations can be found at http://www.auger.org/admin/Auger%20Observatory%20Maintenance%2030JAN09.doc

D. Pierre Auger Project Amendments to the Memorandum of Understanding

The Amendment to the Memorandum of Understanding can be found at www.auger.org/admin/Management/MOU/mou_index.html