

INTEGRATED PLANNING, DESIGN AND CONSTRUCTION

OF A

UNITED STATES COURTHOUSE

A Thesis

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DEDICATION

This thesis and my master's degree are dedicated to my husband, Willard Oakley and twin sons; Jarrett and Jesse. With their unconditional love, inquiring minds and dedication to the educational endeavor, they have made this more than just a research paper. They have sanctioned my quest.

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SUMMARY

The United States Courthouse in Jacksonville, Florida is a recently occupied fourteen floor justice facility. It represents the evolving state of the art in federally funded and managed projects. The execution of this project is about the people who made it a reality. The project took approximately ten years from conception to dedication and involved a cast of thousands of dedicated individuals. It is a story of a road paved with good intentions and realized goals. It is about an unrelenting team with a tremendous synergy who demanded excellence.

The goal of this research was to leave a legacy case study that develops a framework for the interrelated processes of planning, design and construction. In addition, it was my quest to realize essential elements of this turn of the century which would allow the understanding and define a basis for the courthouse in transition. Ultimately, the pivotal issue is substantiated as security and is analyzed on a cause and effect basis.

The body of the case study has been intentionally removed due to security reasons.

Chapter 1

Introduction

“Learning from our Legacy” is a Public Buildings Service program intended to develop cases from recent projects that will allow others to learn from the review and analysis of the cases. This thesis recognizes that the process is important in understanding the final product and that the knowledge of the intellect and human interactions that goes into producing a building should also be preserved to become part of our heritage.

The main aim of this thesis is to derive the essence of the turn of the century courthouse by developing and analyzing the real life data of a recently completed federal facility. The main research methodology is to develop a case study made of primarily individuals that had significant influence on its outcome. Secondary to this research, was an exhaustive research of written documentation to verify details of the events. The final case study is the story of a courthouse with the emphasis on the entire process of the creation of the facility. It is both the transcribing of existing information to give it order and permanence and also charting into unknown territory where the participants can derive new information and relate it to their particular background and experiences. The final conclusion drawn is that this project represents a courthouse program in transition with several changes in needs affecting the product and process. It substantiates that the security aspects of the building are central to the evolution of the state of the art courthouse prototype. Through the study of the entire process of planning, design and construction, information is derived that will allow the details of the Jacksonville facility

to illustrate the salient characteristics that will mark the dawn of a new era in courthouse construction. It is also that through this integrated study, it is realized how the project delivery in the process of changing to meet the needs of the complex world of courthouse design and construction. The case study as a cross-functional examination will also provide the base of knowledge to allow future research endeavors.

Managing Change was the thread that binds. This case study illustrates decisions made and obstacles overcome of a team in their endeavors to plan, design and build a courthouse in a highly transitional time. In developing a landmark, the Jacksonville archetype exemplifies not only a visual image of place, but also leaves a legacy of the journey. At Jacksonville, the team was faced with the priorities and the struggles of a changing culture at the turn of the 21st century when the constant search for excellence was a part of every decision. The search was a heroic effort to meet with the challenge of the changes and make the transition with as much grace as possible.

1.1 Thesis Objective and Scope

The objective of this thesis is to develop a framework for the interrelated processes of planning, design and construction. Next the aim is to derive the salient aspects of the product and process that makes it unique. Finally, the goal is to select key issues that are definitive characteristics of the US Courthouse project delivery process and product. A secondary goal is to create a list of questions that should be addressed for future study.

The scope of this thesis is to develop a comprehensive case study to tell the story of the development of the US Courthouse. This will be accomplished by studying the effects of changing times especially the evolution of security issues on the development of a new federal courthouse set in the context of the turn of the 21st Century.

The intention is to present factual and thorough data to allow both generalizations and specifics to be drawn. My purpose is to build a base of knowledge across time and cross-functional boundaries to allow retrospective analysis. Ultimately, the goal is to allow the realm of possibilities to open up from the understanding of the facts and circumstances faced by the project team.

1.2 Methodology – The Case Study as a Research Approach

In developing the topic, it was realized that the processes of planning, design and construction involve choices that lead to a particular set of circumstances and problems that need to be solved along the way. These alternative decision making paths, joined with a particular time and place create a unique building. Architecture and the process that complete it is like a snowflake. No two processes or buildings are ever the same. This type of process is not based in mathematical certainty, but rather in the building blocks of physical reality. Therefore, the case study was chosen as the primary research methodology because it allows this information to be conveyed in the most suitable way.

The stages of the thesis development were as follows.

- Choose the subject
- Develop the topic
- Decide on research method – Case Study
- Design the case study
- Maintain the story as an essential element
- Do an exhaustive literature search
- Develop an outline and interview questions
- Conduct interviews (11)
- Tour and photograph the facility
- Design and develop the draft of the case study
- Research and record pertinent agency documentation
- Assimilate the information

- Complete the case study draft
- Check back with those interviewed to confirm understanding
- Research specific remaining questions that allows the story continuity
- Develop and assimilate the thesis substantiation
- Review the draft with my advisor
- Create an abridged version for security sensitivity
- Edit, refine and finish

The aim of this research process is to present a focused, significant and original body of knowledge using the case study method to tell the story of the Jacksonville team. It chronologically builds on a base, creating theoretical building blocks as decisions are made and events unfold. It is at once exploratory, explanatory and descriptive while aiming for greater clarity as the facts become apparent. The goal is to create valid and reliable documentation by depicting the story across many references. Understanding is conveyed through explanation as the facts become apparent. This strategy for the methodical representation of the facts is designed to assure the outcome is replete with knowledge. Finally, the discovery process across functional divisions is intended to lead to insightful recommended future research.

1.3 Project Description

The new United States Courthouse, Jacksonville, FL is located at 300 North Hogan Street Jacksonville, Florida 32202. It is surrounded by West Monroe Street, West Duval Street and faces Hemming Plaza. The chosen site is just east of the former US Courthouse and is separated by Julia Street. The site consists of 1.53 acres. The building is approximately 42,416 gross square meters (457,416 gross square feet) and has been constructed providing approximately 27,991 gross square meters (301,279 gross square feet) of usable building space.

The new courthouse facility houses the following agencies: U.S. District Court and Clerk of Court, U.S. Magistrate Court, U.S. Bankruptcy Court and Clerk of Court, U.S. Marshals Service, U.S. Attorneys, U.S. Probation, U. S. Pre-Trial, U.S. Trustees, and the GSA Customer Service Center. It has seventeen Courtrooms. They are comprised of seven (7) District Courtrooms; one (1) Special Proceedings District Courtroom; one (1) Circuit Courtroom; four (4) Magistrate Courtrooms and four (4) Bankruptcy Courtrooms. Ancillary spaces include judge's chambers, jury deliberation areas, jury assembly and grand jury suites, holding cells and other associated judicial and court support areas.¹

¹ GSA, "Detailed Project Fact Sheet" 17 Dec 2002.

1.4 The Owners Team

Understanding the owner and their mission is critical to the planning, design and construction process. In approaching this project, understanding there are many definitions that come under the umbrella of owner. This includes the citizens of the United States, General Services and the ultimate occupants and users of the building. When building a federal courthouse, the United States Courts is the client. "The Team Partnering process began before the architect was picked." When the court's representative speaks of partnering, he is referring to the relationship he and his colleagues have with the General Services Administration. As in the usual client that builds their own house, the average user representative of the court will be involved in the court design and construction process only once in their life. Tasked with defining what they need and assuring its delivery, they are primary stakeholders. The users depend on GSA to serve as their educated consultants, guides and administrators throughout the process. The ownership is therefore shared between the courts as the user and GSA as the manager of the process.

The GSA Portal Website best explains their mission.

The mission of GSA's Public Buildings Service is to provide a superior workplace for the federal worker and superior value to the American taxpayer. The vision is to be the best real estate organization in the world.

PBS is the landlord of the civilian federal government, with a total inventory of over 330 million square feet of workspace for a million federal employees in 2,000 American communities. This comprises over 1,600 government-owned buildings, or approximately 55 percent of GSA's total inventory. The remaining 45 percent is in privately owned leased facilities.

Through the internationally recognized Design and Construction Excellence programs, PBS engages the best private sector architects, construction managers, and engineers to design and build award-winning courthouses, border stations, federal office buildings, laboratories, and data processing centers. It works to restore and maintain the vitality of communities where GSA has a presence.

PBS leases space to federal customer agencies. PBS also repairs, alters, and renovates existing facilities. It has over 100 child care centers. PBS is also responsible for the disposal of property not only for GSA, but for other federal agencies. PBS is a leader in energy conservation, sustainability, recycling, and historic preservation--maintaining more than 400 historic properties in the federal government's inventory. PBS commissions the country's most talented artists to create artwork for new federal buildings and conserves a substantial inventory of artwork from the past. Eleven regional PBS offices, located in major metropolitan centers across the country, deliver comprehensive real estate services.

PBS collects rent from federal tenants, which is deposited into the Federal Buildings Fund, the principal funding mechanism for PBS.

Each GSA office building, laboratory, and courthouse is a symbol of America's democracy, and a significant public investment that must contribute to the vitality of its neighboring community. PBS aims to be the provider of choice for federal agencies, to be easy to do business with, to help federal agencies use real estate more efficiently, and to provide lasting value in everything it does.²

The head of the court as client hierarchy when it comes to facilities is the Administrative Office of the U.S. Courts or AOUSC. It is the administrative arm of the court system and provides assistance in the matters of building and is tasked with being the primary liaison with GSA and the U.S. Marshals Service.

Beyond the primary clients, the other tenants of the facility supporting the courts system also have requirements that needed to be met. They are also on the owner's team. They include the U.S. Marshals Service which provides judicial security. In addition to the District court, Circuit Court, Magistrate Court and Bankruptcy Court, and the Clerk of Court other related agencies had to be considered in the overall picture. These agencies included Pre-trial Services, U.S. Probation, U.S. Attorneys Office and the U.S. Attorney's Office. The Public Defender's Office was a part of the program originally, however, later was to be located elsewhere.

The Constitution, Article III provides for a Supreme Court under the direction of Congress. The Supreme Court resides in Washington, D.C., however most of the judges

of the federal system are located throughout the United States. Congress has divided the country into 94 federal judicial districts, each with its own U.S. District Court (USDC), the federal trial courts. The United States District Court's are divided into 12 regional circuits, and established within each circuit a single U.S. Court of Appeals (USCA). Litigants who lose in the USDC may appeal their case to the USCA, which reviews cases to see whether the trial judge applied the law correctly. The USCA is the final stop for most litigation in the federal system. Jacksonville, part of the 11th Circuit which includes Georgia, Florida and Alabama is one of the only court of appeals within the circuit. Most federal court facilities do not house USCA judges or courtrooms.³

The Jacksonville Courthouse also will hear Special Proceedings cases. Created by an act of congress on April 2, 1982, this special Federal Circuit Court has a national jurisdiction and is subject oriented. Among other types of cases, it hears cases where the United States is the defendant.⁴

² "Public Building Service." An interactive Tour of US Courthouses, 3rd Edition, March, 2002.

³ WBDG Subcommittee, Federal Courthouse. 8-28-2002.

⁴ "United States Court of Appeals." Encyclopaedia Britannica. 2003.

1.5 The Transitional Courthouse

The US Courthouse project in Jacksonville is a microcosm of how the world our civilization and the world as we know it are changing. It is also about how the design and construction world is changing to meet with its requirements and expectations. Anxious to begin the initiatives of an era, the Jacksonville project team was often applying interim guidelines, programs and goals that were in the development stage. In this sense, the project was in the experimental stages of what was to define a new era in federal courthouse construction.

In the early 1990's, following a lengthy analysis of space in Federal courthouses nationwide, the Administrative Office of the U.S. Courts (AOUSC) determined that the Judiciary's housing was at or approaching a state of crisis; approximately 200 Federal courthouses, nearly one out of three, would be out of space within a decade. To meet this critical demand for space, the General Services Administration (GSA) would need to undertake the largest courthouse construction program in more than fifty years, estimated to cost \$10 billion. In addition, the size and complexity of Federal courthouses, combined with the magnitude of the program, would require a systematic approach as opposed to proceeding project-by-project. To this end, the Judiciary has established and updated a prioritized five-year list of projects and GSA has created The Center for Courthouse Management (formerly known as the Courthouse Management Group).

The Center ensures the consistent, excellent, and cost-effective delivery of the courthouse construction program. The Center is responsible for nationwide policy formulation and general management of new Federal courthouse construction and the modernization of existing courthouses. The Center's duties are to:

- Ensure a national, programmatic approach to courthouse construction;
- Formulate national policies and standards;
- Establish benchmarks and oversee regional performance;
- Support regional offices and project managers on individual projects;
- Ensure a balanced allocation of resources among competing courthouse projects;
- Identify best practices and lessons learned; and
- Maintain links with the Judiciary and represent GSA/PBS with external stakeholders such as OMB, Congress, GAO, and the press.⁵

⁵ US General Services, "Courthouse Programs" 02 Nov.2003

This initiative, started while President H.W. Bush was in office was part of a plan intended to spur the economy. Much like the efforts of the Works Progress Administration (WPA) in 1930's and early 1940's the amount of money pumped into an economy will enable the creation of an era of architecture. Like sleeping giants, those that can and will have a part in directing its outcome such as GSA and the US Courts group woke and rose to the occasion. New groups were formulated, old groups and departments were re-worked and out of this came the flurry of new ideas and policies and procedures to assure those important guidance to assure quality was instituted. The task is difficult and can not be diminished. Be assured the values they wished to stress and how they are implemented will determine the new Federal Architecture.

A federal building program, although a noble gesture, and put in place for the long run, takes time to flourish. The Jacksonville project is about a project that got caught in between. In 1993, already obsolete, the old facility, built in the WPA era was in dire need of replacement. Unfortunately, although slated to begin, congress wanted to assure the procedures for assessing need were correct. In addition, they wanted to assure the \$1.8 Billion that they were about to appropriate would be correctly spent. A "time out and review" was then instituted on 12/5/94. In about a year this figure was reduced to \$1.3 Billion. Even though this took only about a year, priorities changed and it was pushed down on the list so it would be delayed even further. In the meantime, the cost of executing the project was escalating. By the time it was funded, it is understandable that the funding that was appropriated would be accepted as ample by the team. Asking for additional money would of course rock the boat.

Chapter 2

Conclusions and Recommendations for Future Research

The following conclusions and recommendations were made.

The context of the turn of the century was defined by change. The major global changes that affected this project were the emphasis on the expansion of the courthouse program and unfortunately, the advent of terrorism on US soil. The project spanned from the last decade of a century into the beginning of a new century. As a result of these global changes, GSA and subsequently the project team responded in order to meet the customer's expectations. The project team through teamwork endeavored to reach a level of excellence while still keeping the project on time and in budget.

The project was seasoned with other new programs and goals. They included the beginnings of the Design and Construction Excellence Programs. It also served as one of the pilot facilities for the inclusion of the metric system as a measure to design and construct the facility.

These changes are first evidenced in the early planning stages of the project. The dire need for better and expanded quarters for the Courthouses across the country was recognized during the Bush Administration Era in the early 90's. Funding was at the teams fingertips when a "time-out and review" stopped the funding process. This led to the examination of the core processes in planning the facility. The need to update the criteria and the consistency of prioritization was at the core of the congressional inquiry. In addition, the amount of funding required for the facilities pending approval and those slated for the next era of funding was reduced. This emphasis on tightening the budget so

the project could proceed in the uncertainty of the newer and more stringent policies set the stage for the challenges to come.

There is no other aspect that effected the design, construction and planning of this facility that compares to the security issues. Even before the bombing of the Alfred P. Murrah Building in April of 1995, the concerns of security in Federal facilities had begun to heighten. This event sealed the prioritization of security in new buildings. Most criteria had not been solidified. There was little guidance established covering the engineering methodology to be used. Widely used testing of the materials used in the applications that are recommended to meet the needs also had not been done. The project needed to go forward while the manuals, criteria and other refined information was in the development stages.

The planning stages did not account for the full impact of the security requirements. Therefore, when the funding for construction of \$80, 874,000 was allocated this amount did not account for these costly requirements. The site selection and the alternative studies did not take into account the site requirements. Possibly a larger site may have been more cost effective. The later reduction of the parking from 200 spaces to 82 made reference possibly to both the restricted site and budget. An alternative that could have been studied was the use of both the final site and the demolition of the existing building. This would have provided more site circulation and the setbacks that would have been advantageous to the resolution of many concerns including the ultimate cost of the structural system.

The next phase was concept design. The only thing you can base your decision on are the facts at hand. This may have been a case of "if only I had known." When

balancing the resource allocation decision to include scope or quality level, the cost allocated to particular elements determine their value. The use of the curtain wall and its selection as a material may have changed.

The design down to its very bones reflects on the security. First the layout of the floor plate to allow circulation. Both its circulation paths and the adjacencies are directly related to the security requirements. Second in its hierarchy in the vertical dimension is based on public access. The image of the courthouse, once open and accessible has turned inside out. In the past, grand internal lobbies and stairways graced the public spaces. At Jacksonville, the public space was a transitional space. As the security requirements and their physical ramifications became more apparent, this space became even more separated and secured from the existing structure. The genius of this architecture lies in the response to the security concerns. Although the cost of the view was expensive because of the upgraded curtain wall system, it has intrinsic value. This spatial attribute can be seen to replace the grand ornamented internal spaces with outstanding views. The vision through the glass seems to, in its own way, bring the outside in. It is ironic that when I deleted illustrations due to security concerns, these panoramic pictures stayed. They point to the future of a great city. Truly the natural light and views are at the essence of the architecture.

When all lay-outs and major decisions are supposed to have been solidified, the team met with the biggest design challenge. Blast and progressive collapse design were required at the construction document stage of design when technical execution was to be the focus. The structural frame sets the dimensional standards for the layout of all other spaces and details. This issue put this aspect in limbo. It not only effected focus for the

completion of the design, but also budget. This can be evidenced in the inclusion of this issue into the schedule of activities.

The following timeline explains how the security impacts the schedule. It shows how the focus shifted from completing the documents to security.

- 5/6/97 RFP to A/E for Blast Study
- 5/19/97 Begin CD's
- 10/13/97 Security Criteria Analysis
- 10/29/97 House Appropriates Money
- 11/17/97 90% Construction Documents
- 12/2/97 Security Initial Cost Estimate
- 12/9/97 90% Cost Estimate
- 1/17/97 Conduct a risk classification
- 5/1998 Presidential Directive 63 Issued
- 5/6/98 Design Complete

The value engineering studies done with painstaking precision also were less than whole missing this important piece of the puzzle. They were done before this time without consideration of this the impact of this important information. Other program management efforts including design review were impacted by the absence of these physical security changes.

The biggest impact was on the budget and the cost initiatives. The CM Agency and cost estimator consultant were ironing out detail level issues when this major issue impacted the entire budget. One important issue to note is the disagreement as to the construction time. Because of overheads the time can affect the cost significantly. The

CM Agency and cost estimator were debating over 18 or 24 months, where the time finally accepted in the contract was 36 months.

The following budget recap illustrates the change in the cost estimates.

Because the target cost must be at least 5% below the construction funding the target amount was required to be met. All of the contractor's submissions in response to the solicitation for construction were over budget.

This was the pivotal point which effected the next phases of the project. The resulting problems and methods used to solve the problems include the alteration of procurement and project delivery methodologies and requirements; construction difficulties, design changes and advances in management techniques.

The schedule commenced as is explained in the following schedule fragment.

4/8/99	Constructability Cost Evaluations
5/1/99	Select Beers/Skanska
5/19/99	Construction Phase Kick Off Meeting
5/26/99	Constructability Review Meeting
6/29/99	Contract Offer and Award
6/29/99	Action Plan on Constructability
7/1/99	Notice to Proceed
7/19/99	Contract
8/18/99	Constructability Evaluation Response
11/3/99	Baseline Cost GMP - No Blast
11/19/99	Mat Foundation Pour
9/21/00	COR 38 - Includes PC01-PC11
10/6/00	Firm Fixed Price Contract

Because the project was over budget at the time of negotiations, Amendment #3, a deduct option that verbally defined the cost of the progressive collapse and blast upgrades, was not exercised. A Successive Target Contract with an incentive price revision was awarded with a ninety day "design completion" stage. It took approximately 14 months from July 1999 until October 2000 to firm up the requirements and the price. In the meantime, the construction had started and the construction documents were not changed. The review of the submittals was being completed just prior to the construction of the next piece of the structure, surely making a project that was committed to finishing on time, very stressful.

What was a carefully analyzed and executed design changed content due to the overage in budget. Cost cutting versus value engineering changed the details to the effect of approximately \$4,000,000. The redesign of the structure stemmed from the recommendation of the blast consultant. The blast consultant thought a different approach would yield savings. In the end with the impact to the schedule, and the shifting of the steel, it did not.

The additional money of approximately \$2,775,000 that was allocated for the blast design in retrospect was not ample. It was estimated the upgrades could be accomplished for \$8/SF. The additional funding was approximately \$6/SF. The post-occupancy analysis indicated the costs were in the neighborhood of net \$11.58/SF and \$20.65/SF or between \$5,000,000 - \$9,500,000 ranges.

One can only imagine the other impacts due to this additional cost and the disruption to the normal routine. The curtain wall is estimated to cost \$150/SF. This is in the neighborhood of six to seven times what a standard curtain wall under these conditions would have cost. Although one can not draw direct correlation of the budget to the finish work, it appears to have suffered due to the inordinate amount of money dedicated to the structure and the exterior cladding. Ultimately, the move-in date was impacted.

The question that begs to be answered here is if partnering saved the day. The creative process that made everything come together in the wake of these challenges is a study in conflicts and problems and of a team that centered on the problems and creatively solved them as they came along. The team through organized management processes, collaboration, attentive involvement and just plain hard work counteracted the

problems and made the plans come to life. The most universal problem encountered that underscores all other issues was the team's continual effort to meet the requirements within the budget. The written records and the memory of the participants interviewed, support this understanding of the real balancing act. Given the fact that almost all problems can be solved given enough money, the struggle was a series of trials, compromises and limited resources due to their valiant effort to make the building a safer place to be.

In every facet change was present. Change became the golden thread that binds. The impact on the process and product can be seen in many critical stages. Transitional issues were evidenced in the Planning and Funding processes and priorities. The security requirements have changed everything and became a source to question the validity of the very conception of the original planning and design decisions. The augmenting of the security requirements at the end of the design stage became the underlying cause of other struggles to meet budget and the central dilemma faced by the team. In turn, other unexpected effects of the changes were necessitated because of the aforementioned changes including the creation and methodology of the technologies to solve the problems and the management processes and contracting procedures. Decisions that stemmed directly from these causes were carried out to meet goals within the system. The design and construction excellence initiatives provided the framework for conscious solutions.

This epic endeavor begets the resulting monumental architecture; the legacy of the team, the City of Jacksonville and the nation. The US Courthouse represents a body of knowledge of one of the first major justice facilities of the 21st century. Shrouded in a

new cloak resulting from the transition into a new era, it stands as a shining example of defiance of failure and outward expression of a beauty that is not just skin deep.

The second goal of this thesis is to provide a list of questions that are applicable for future research. The integrated case study provides the basis for future endeavors and scholarly research. It not only covered issues that were strategic to the project, but also explored aspects such as HVAC and Commissioning that will be effected by future initiatives. I think the understanding of the interrelationships between each of the constituents of the building process is a new and exciting step towards a more refined and integrated approach. In this spirit, I recommend the following questions be addressed for future research.

Planning and Design

- Should the alternatives at the planning stage include the feasibility of including additional land for setbacks and possible expansion?
- Should an ideal design such as the “courthouse of the future” for something like a world’s fair be planned and designed without restrictions of budget, site, etc. to explore the possibilities and to better understand the restrictions and their impact.
- Should detailed room data sheets be developed early in the process as design guidelines to share with the project team?

Program Management

- Is Value Engineering without contractors and sub-contractor participation and commitment theoretical?
- Should a formal VE study be held at a later in the design stage or at construction award to capture more of the detailed possibilities of cost savings?

Project Delivery

- Are there inherent problems in the delivery system with bid day surprise over-budget
- Is the timing for the beginning of involvement for contractors and sub-contractors soon enough in the incentive type contract exercised. When should this be?
- What type of contract would be ideal? What are the regulations that are stopping the execution of this contract? How can this be overcome?

Construction Delivery

- Are there other ways of accomplishing the equitable Adjustment Procedure?
- Would more formal requirements for deliverables such as that exercised in the design process make the successive target contract process better? How much time would this take? How would that be structured?
- Was the CM agency effective? What might make them more effective?
- Why did the adversarial relationships over possible differences between the owner, designers, and contractors that can distract from the project objectives not occur? When they did occur; how were they resolved? Did partnering save the day? What are its pros and cons?

General issues

- Was the risk sharing management adequate?
- What were the lags in the schedule? What is the benchmark for efficiency with manpower and labor in both design and construction? How did the time-out and

other issues affect the project? Was the original budget adequate with the changing requirements?

- How much design resolution took place during the construction process? Should the process have slowed down to allow thorough resolution and revision of construction documents of the changes that occurred?
- How can the lessons learned be integrated back into the process for the next facility?

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