



Bechtel Engineers Resilient Network for LNG Terminal ADC Recognized for Superior Quality and Service

CASE STUDY

Introduction

The project objectives for the owner of one of the world's largest liquefied natural gas (LNG) terminal were straightforward: the facility needs to be able to process 4 billion cubic feet of LNG per day, and the project needs to come in on time and on budget. To support these objectives and ensure a long service life for the client's telecommunications infrastructure, lead engineering and construction firm Bechtel sought one vendor for cables and connectivity for the massive complex. This approach would ensure minimum difficulties during the project and promise error-free, easier management of the facility for many years to come.

Design Philosophy

Typical design for an industrial outside plant (OSP) campus backbone includes separate cabling and connectivity subsystems for voice, data and each of the process control systems, a requirement often driven by long-established practices within the client organization. Yet for this project, Bechtel was able to drive a different design, creating a single, converged optical fiber backbone for all process and non-process systems for the plant.





System designers determined that the natural unit for segregating applications in the converged fiber backbone should be the buffer tubes within a stranded loose tube optical fiber cable. In this design, each application is allocated a number of tubes. If, for example, the Distributed Control System (DCS) required eight strands of fiber to support communications across a particular cable segment, applying 100 percent spares for growth sets the minimum requirement at 16 optical fibers. With 12 optical fibers per tube, the DCS is allocated two tubes (24 optical fibers) within that segment. Of course, for redundancy, DCS requirements in that location are also allocated another two tubes within a different cable.

Physical segregation of applications then extends to the termination points in buildings and mounted on process equipment. Within each building, all optical fiber cables terminate in dedicated cabinets. Within each cabinet there are patch panels dedicated to each application. For example, within a cabinet, tubes one and two (for the Fire and Gas detection system) in cable A are terminated on the Fire and Gas patch panel. Tubes 3, 4 and 5 from cable A that support the Emergency Shut Down (ESD) System would terminate on the ESD patch panel, and so on.

The optical fiber backbone was designed as a star topology radiating from the Main Control Building. For 100 percent redundancy, each central cabinet was duplicated. In addition, a layered keying structure was instituted to restrict access to cabinets and panels. All fiber cabinets were keyed the same throughout the facility, but patch panels mounted inside cabinets for each system were keyed uniquely. As an example, a Safety Engineer would have keys to all cabinets across the plant. However, he would only have access to his own panels within each of the cabinets.

Once the logic was set, the converged optical fiber backbone was not difficult to design. More challenging was the human factor, making sure the converged design served the needs of each of

the engineering disciplines on the project, ranging from the voice system to safety and alarms to process control.

Solution

The project called for over 6,000 optical fiber terminations in 23 cabinets across 17 buildings and 21 outdoor process equipment locations, many of which were situated in hazardous areas. In addition, the project included 250 work area telecommunications outlets across the campus to support voice and data needs for operations personnel. Specifications required that all structured cabling components come from one manufacturer. Upon review of several vendors, ADC's TrueNet® products were chosen for the project. TrueNet cable and connectivity hardware specified for the project included armored OSP loose tube optical fiber cable, fiber patch cords, FL2000 fiber termination and patch panels, Category 5e cable and patch panels.



FL2000 Series Fiber Panels

"ADC is one of the few vendors that have a complete end-to-end connectivity solution," said Mike Handel, Bechtel's principal telecommunications engineer for the project. "One manufacturer for all structured cabling components reduces installation issues and makes it easier on the owner, who will be responsible for maintaining the system over the next 20 years. Ultimately, settling on ADC reduces the total cost of ownership for our client," he said.

Benefits of Working with ADC

Once into the project, it was apparent that Stratos, Bechtel's telecommunications engineering and installation subcontractor, had chosen the right partner for the project. Not just for quality and practical features of TrueNet cables and connectors, but for service that was always above and beyond expectations. For ADC, this is *modus operandi* every day.

Months before the project was even on paper, ADC's sales representative provided pre-project assistance on everything from technical and design issues to relationships with local distributors. This proactive approach proved invaluable as the project developed, according to prime contractor Bechtel. "Our ADC rep is the unsung hero of the project. He anticipated technical and scheduling issues. He reserved factory production time and made sure our orders received special attention. He also made sure our material shipped ahead of promised delivery dates," said Handel. "Every project in which I've been involved has had material delivery issues, except this one. I have to credit ADC and Graybar for having material on site, on time," said Handel.

In fact, the list of examples where ADC went out of its way to service Bechtel, Stratos, and the end customer are numerous.

Part of the design called for two-strand armored optical fiber. Yet no vendor or distributor was stocking armored cable with just a single pair; the minimum in the marketplace was six-strand. When asked for 40,000 feet of single-pair armored cable, ADC said yes—immediately—and shipped it to distribution in five business days. This flexibility in being able to produce a special run of fiber cable is due, in part, to the fact that ADC owns and operates its own optical fiber cable



ADC Armored OSP Loose Tube Optical Fiber Cable

manufacturing plant. Without the single-pair armored cable, additional labor and junction boxes for hazardous areas of the plant would have driven costs up astronomically, according to Stratos project manager John Bertrand.



"Between factory pre-loaded (connectorized) fiber panels and the special run of fiber cable, we saved at least \$50K in labor by the mid-point of the installation," said Bertrand.

In another example, an optical fiber cable was damaged on a long pull. The cable was run over by a forklift and required splicing at the facility. Even though the cable showed no different testing results, Stratos was leaning toward replacing the cable to make sure no issues cropped up down the road with this important client. At 5,600 feet, it was going to take 30 technicians one day to re-pull that cable. Luckily this work was avoided.

"ADC told us as long as we spliced according to Telcordia standards, ADC would still warrant the cable. They didn't hesitate. They provided the cover we needed to forego the rework and move on with the rest of the project," said Bertrand.



ADC Singlemode Fiber Optic Patch Cords

CASE STUDY



Another bit of service from ADC that saved an extraordinary amount of time was pre-testing of components. Stratos had a project deliverable to produce test results before cable reached the job site. The client expected to see the test results, too. When asked for help, an engineer at the ADC factory asked for the required tests and reporting format and ADC provided testing and reporting per Stratos' contract terms. Stratos didn't have to do any of the extra work of testing and formatting results for the client—ADC did it all.

In a final example, rather timely advance thinking by the ADC technical sales rep ensured on-time completion for important segments of the project. At some point, there was a mix-up specifying and ordering fiber jumpers; the requirements list came in three weeks late. Fortunately, the ADC technical rep has seen many optical fiber backbone and cross connect projects in his day and was able to anticipate the number and lengths of optical fiber jumpers for the project. As a result, the jumpers shipped the next day.

"Without those jumpers, there would have been a delay bringing up safety and control systems. ADC's experience really paid off," said Bertrand. "He (ADC sales rep) knew what we were up against early on and anticipated our needs. He always is asking the right questions. We really consider him a valuable part of the construction team," he said. "They (ADC) get the credit for keeping us on schedule."

Conclusion

The extra attention by ADC certainly helped Bechtel and Stratos meet their timelines and commitments. However, the quality of ADC cable and connectivity became apparent to everyone on the project. Combining high quality with a single vendor approach for a consistent look and feel that makes for easier installation and maintenance, Bechtel and Stratos have positioned their client for years of worry-free operation, even as the network grows and changes.

"I looked at all types of panels. Some have bells and whistles we would never use. All we want is solid components and cable that is going to be there operating for years to come. We know once we put it (ADC cable and panels) in, we don't have to worry about them," said Bertrand. "Across the board, they (ADC) are a cut above the others."



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