WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS

"consultant"®

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Cousins Canal Walls, Jefferson Parish, Louisiana

By: Thomas W. Wells, P.E., S.E.

As work continues on the repair and bolstering of regional hurricane protection in the New Orleans area, NELSON has been involved in several projects for the U.S. Army Corps of Engineers on the lake front, IHNC, St. Bernard Parish, Plaquemines Parish, and Jefferson Parish. The subject of this article is a small section of this regional defense system on which NELSON applied innovative design approaches to develop an improved project. The Project consists of approximately 900 foot long, 8 foot tall concrete hurricane protection walls on each side of the discharge channel of the Cousins Avenue Pump Station on the west side of the Harvey Canal, in Harvey, Louisiana, on the west bank of the Mississippi River, near New Orleans.

The purpose of the Project is to replace the existing I-walls with stronger, pile-supported "inverted T-walls." I-walls performed poorly during Hurricane Katrina, collapsing in some areas and causing extensive flooding.

The walls extend eastward from Destrehan Avenue and tie into the end of an existing floodwall on the north side of the channel and into the existing flume at the Sector Gate under Lapalco Avenue bridge. The walls are supported on vertical and battered H-piles, which are approximately 70 feet long.

The floodwalls consist of cast-in-place reinforced concrete continuous pile caps and wall stems. The pile caps and stems are placed against existing I-walls, using them as forms, and anchored to them so that they behave integrally.

The new concrete stems are 18" thick, and extend 7" above the top of the existing floodwalls. The pile caps are 3 feet thick and 7.5 feet wide, typically.

Preparation of existing I-Wall for bonding with new construction

The Project, as designed, used concrete construction to provide an economical installation that will require essentially no maintenance.

USUAL APPROACH

The usual and initially-proposed design would have consisted of the following steps:

(1) installation of temporary retaining structures (TRS, COE nomenclature for a dewatering cofferdam) to provide flood protection during construction,

(2) removal of existing "I-walls" (concrete stems supported on steel sheetpiles),

(3) removal of I-wall sheetpiles,

(4) installation of new sheetpile cutoff walls

(5) installation of battered and vertical load-bearing piles,

(6) construction of pile caps and wall stems, and

(7) removal of temporary retaining structures.

NELSON'S APPROACH

During the initial stage of the project, the Project team conducted a brainstorming session to develop a better solution,

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finding ways to improve the basic project, i.e.:

less cost,
shorter schedule,
lower risk,
high quality.

The Project team's proposed design eliminated steps (1), (2), (3), (4), and (7), reducing cost, project schedule and risk, which are the primary goals for any successful project. The existing hurricane protection was never removed, so risk of flooding during hurricane season was minimized. By maintaining the existing hurricane protection during the new construction, the need for a TRS was eliminated, reducing cost and schedule. Eliminating removal of the existing I-wall also reduced cost and schedule. Finally, using the existing I-wall concrete as one of the forms for the new structure reduced project cost and schedule even further.

These innovative project planning and design approaches created a project that benefited the Owner and the Public.

DETAILS

The walls and pilecaps were designed to withstand multiple load cases of various combinations of water elevations, debris, and vessel impact with various load factors applied to reflect the probability of occurrence. These load cases complied with the new criteria for design of hurricane protection facilities, HSDRRSDG: "Hurricane Storm Damage Risk Reduction System Design Guide." This standard was developed after Hurricane Katrina and included many lessons learned from that extreme event. NELSON developed spreadsheets to make the design of multiple load cases efficient, including generation of pile loads for the various load cases.

Preparation of existing I-Wall for bonding with new construction

Construction problems were avoided by including "constructability" in the design considerations and criteria. Elimination of the temporary retaining structures removed the possible problem of interference of TRS sheetpiles with battered bearing piles, and the soil being weakened by the voids resulting from the TRS piles and I-wall piles being removed. Avoiding the requirement of TRS's eliminated the contractor's requirement to design COE-accepted structures, and maintain it during the construction.

Substantial cost savings were realized by the design:

a. Avoiding cost of installing TRS's
b. Avoiding demolition and removal of existing I-walls
c. Avoiding cost of removing I-wall sheetpiles
d. Avoiding cost of new sheetpiles
e. Avoiding cost of removing TRS's
f. Reducing construction period

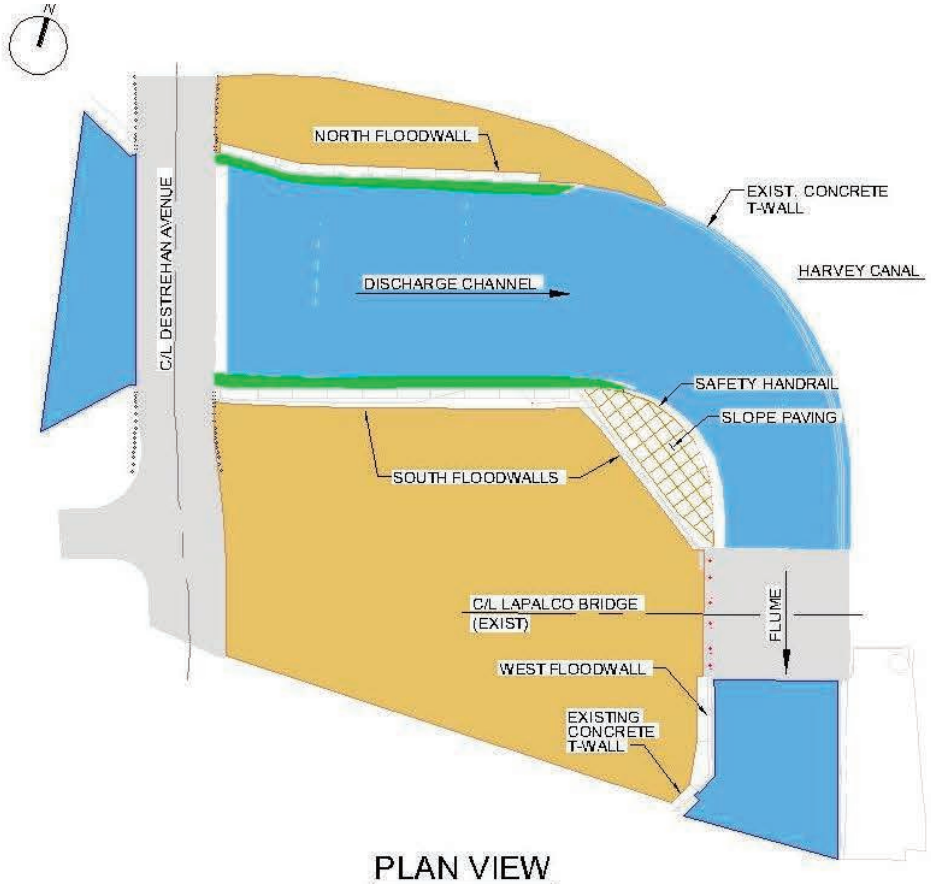
The Project is not prominent or accessible to the public, so special architectural treatment of the concrete was not appropriate.

The concrete received a rubbed finish, although the plain concrete walls had very minimal imperfections.

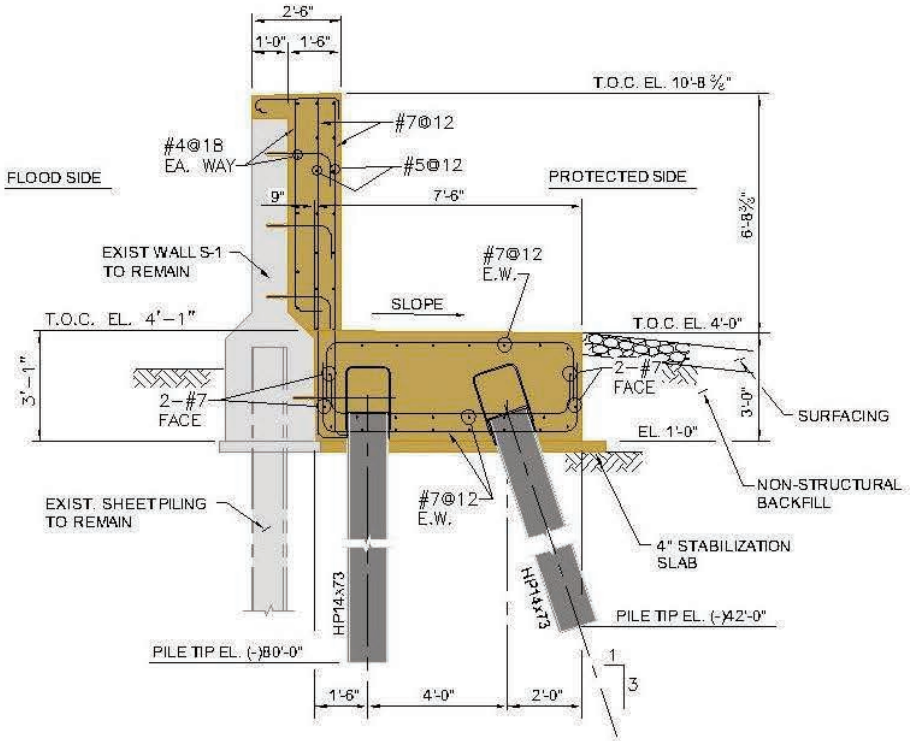
The ground surface of most of the site was finished with crushed stone. An inaccessible portion, between the new wall and the discharge channel, was paved with concrete to eliminate the need to mow or maintain the surface. Handrails were installed along the edge of this area, adjacent to the discharge channel, to provide safety from falling into the water.

A steel personnel crossover, consisting of ladders on each side, a small

Construction of base and stem of floodwall



PLAN VIEW



SECTION

platform at the top, and a locked gate, was provided on this portion of the wall to provide access for inspection or repair by the Owner.

Placing the new T-wall concrete against the existing I-wall is an innovative approach to construction of the new wall. Epoxy-anchored reinforcing bars bond the two structures together to create integral behavior. Nevertheless, the wall stem and the piles were designed to be adequate whether the bonding is effective or not, providing a safe and robust structure.

ACI AWARD

NELSON received an "Award of Merit" from American Concrete Institute (ACI) for this project at the January 2011 Annual Awards Banquet.

TEAM MEMBERS

NELSON's lead structural engineer on this project, Ken Schlag, P.E., was responsible for all structural and foundation design. He supervised or performed the calculations for the design of the walls, foundations and support piles. He performed foundation analysis using two specialized programs: CPGA and Group7. These programs analyze the pile reactions for structures with horizontal and vertical loads, including "unbalanced" horizontal loads that result when soil resistance alone isn't adequate to resist the destabilizing loads on the structures.

NELSON's project manager, Tom Wells, P.E., S.E., was responsible for overall project performance and provided input to the design approaches and concepts.

The U. S. Army Corps of Engineers contracted with Waldemar S. Nelson and Company for the design of this project, provided technical criteria and periodic review of design submittals, and reviewed and accepted NELSON's proposed innovative solutions. The Corps' Chris Dunn, P.E., was the senior structural engineer, and Jeremy Laster was their structural engineer. The Corps oversaw the construction contract, providing inspection, quality control, coordination of various participants in the project, and coordination of responses to the Contractor's Requests for Information and reviews of Contractor's Submittals.

Eustis Engineering Services, L.L.C.'s geotechnical engineers participated in the brainstorming sessions to develop innovative approaches to design and construction

of this "ordinary" project. Eustis' Tom Stremlau, P.E., provided geotechnical engineering to ensure that the proposed design was practical, economical and reliable during construction and service. Eustis also provided pile load capacity and other geotechnical recommendations, investigated alternative/creative means of providing groundwater cutoff walls, and assisted during construction with responses to RFI's and evaluation of submittals. Eustis monitored and interpreted pile load tests and developed revised pile capacity curves.

E. Berkley Traughber and Associates, Inc. participated in the initial development of design concepts that led to a drastically improved project with lower cost, shorter schedule and lower risk during construction. Dr. Traughber subsequently provided independent technical review of designs, plans and specifications to ensure accuracy and compliance with Government requirements, including HSDRRSDG.

Completed Floodwall

NELSON PROJECT WINS ACI AWARD

NELSON recently completed design on a 5 acre expansion of the Napoleon Avenue Container Terminal. This expansion, completed for the Board of Commissioners of the Port of New Orleans, was another addition to the existing terminal which handles the Port's containerized cargo, and included expansion of an underground data and communications network providing for future growth of the terminal.

The pavement is designed to handle extremely high concentrated loads due to the weight of containers stacked 5-high and the equipment that handles the containers. The container stacking can result in concentrated loads up to 200,000 pounds and the loads from the stacking equipment are as high as 230,000 pounds per axle.

With the generally soft soils found in the area, the pavement section consists of 18" unreinforced concrete over 22" rock base course placed on a scarified and recompacted subgrade. To achieve the design criteria, the concrete must reach a specified flexural strength of 900 psi in 56 days. This represents an extremely high flexural strength that is not typical of pavement concrete specification. To the knowledge of the design team, no pavement in Louisiana has specified this strength requirement. The strength is specified at 56 days instead of the traditional 28 days to provide for a more economical mix, providing some cost savings to the port.

Back l to r; Jeff Young, Hard Rock Construction, Debbie Mitchell, NELSON, B.J. Eckholdt, Lafarge North America, Bill Rushing, NELSON, Timothy Kay, NELSON. Front l to r; Kenneth Nelson, NELSON, Thomas Wells, NELSON, Deborah Keller, Port of New Orleans, Jason Juneau, Hard Rock Construction and Nick Mallouli, NELSON

In addition to the pavement design, NELSON was responsible for the demolition of an existing building and pavements. Existing utilities were either removed or relocated as needed. Extensive coordination between AT&T, Entergy, NELSON, the Port, the Operators and the Contractor was required from the design phase through completion in order to minimize disruption to operations.

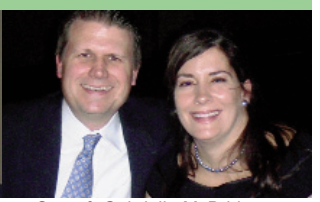
On January 20, 2012, the Louisiana Chapter of the American Concrete Institute, at its annual banquet to recognize outstanding concrete construction in Louisiana, awarded this project an Award of Merit. On hand to receive the award were members of the team from the Port of New Orleans, NELSON, the Contractor (Hard Rock Construction) and the concrete supplier (Lafarge North America).

2011 Christmas Celebrations

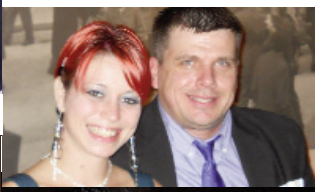

Holly and Winndell Powell


Bob and Lori Myers


Patty and Robert Griffin


Scott & Gabrielle McBride

Kim Bellelyoun & Martin Patterson




Sally Zintak and George Brower


Charles & Dottie Nelson, Ken Nelson


Victory Belle & Charles Nelson


Patrick Tang & Michelle Horng


Robert Griffin, Felicia Abu-Fannoun and Angel Boudreaux delivering the Angel Tree gifts donated by the Houston office to the Salvation Army.

The New Orleans employees celebrated Christmas with a dessert party and the Houston employees held a pot luck lunch.

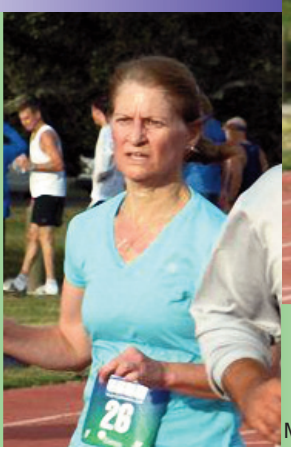

Karen Martin delivered the gifts purchased for adopted families in the Volunteers of America Christmas Giving program. Gladly accepting the donation is Anna Scheffy, Marketing Coordinator for VOA of New Orleans.

2011 YMCA Corporate Cup


Bobby Baker


Harold Brown

The YMCA Corporate Cup race was held Sunday, December 4th at New Orleans City Park. Participants for 2011 were Bobby Baker, Harold Brown, Judy Christiana, Thi Dao, Mary Dauzat, Courtney Hymel, Matthew Gaudet, Derrick Millet, Jack Neelis, and Roy Phelps.




Thi Dao

Mary Dauzat

Stephen O. Johns, P.E.

American Society of Civil Engineers Awards President's Medal

Steve Johns, Vice President of the New Orleans Branch of the American Society of Civil Engineers, was recently awarded their President's Medal for his efforts in incorporating the Branch's accounting system into the ASCE National system. The New Orleans Branch became one of the first to do this with the goal of greatly simplifying the accounting effort at the National level.

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