



**RAMJACK**<sup>®</sup>

# 2011 CASE STUDY

Volume: 2011 | Issue: Mt. Carmel

## MT. CARMEL HEALTH, WELLNESS, AND COMMUNITY CENTER

Historic Mt. Carmel Church  
Trinidad, Colorado

**HISTORIC CHURCH,  
INNOVATIVE SOLUTION**  
Three Phases to an Award-Winning  
Engineered Remediation

**Engineering  
Excellence**

2011 American Council of  
Engineering Companies of  
Colorado Engineering  
Excellence Award

# Straight Line Construction

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### CASE STUDY 2011



## SITUATION

The Mt. Carmel Health, Wellness, and Community Center development included a number of exciting engineering and construction challenges. The project entailed constructing a basement link addition between the Mt. Carmel Church and the adjacent Music Hall, and a new walkout basement beneath the historic church.

The historic Mt. Carmel Church was built in 1907 by Jesuit Fathers with an unreinforced sandstone block foundation. Innovative design and construction methods were required to successfully complete construction underneath the existing structure. Straight Line Construction,

together with Printz Engineering Services, LLC, a shoring and underpinning engineering firm, developed a thoughtful, creative, and practical solution to address the unique challenges this project presented.

## SOLUTION

### PHASE 1-Soil Nail Construction

The first phase of the project involved constructing a temporary soil nail wall along the existing alley to allow excavation of the basement link addition. The soil nail wall was 16 to 22 feet high with soil nail lengths of 15 and 20 feet. Between 3 and 5 rows of soil nails were installed, depending on the wall height. The soil nails were drilled with a 3 inch diameter sacrificial drill bit, reinforced with 32mm hollow reinforcing bars, and the annular area around the bars was grouted solid. The face of the excavation was reinforced with welded wire fabric and horizontal waler steel and a 4-inch thick shotcrete facing was applied to prevent raveling and sloughing of the retained soils.



The soils nail wall not only had to retain the soils during excavation, it also had to withstand traffic loads from the adjacent alley. Once the soil nail wall was completed, the foundation for the basement link addition was constructed and underpinning of the church began.

### PHASE 2-Foundation Stabilization

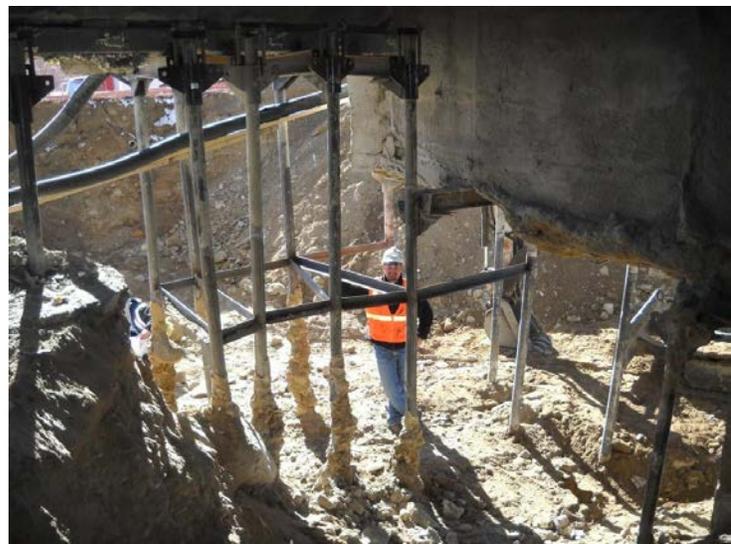
The initial phase of the foundation stabilization consisted of reinforcing the historic sandstone block foundation by drilling through the foundation and bolting channel steel on both sides. Welded wire fabric was then installed and both sides of the newly reinforced foundation were sprayed with shotcrete to allow the foundation to span between the underpinning elements.



### **PHASE 3-Underpinning and Excavation**

Underpinning of the church foundation consisted of installing cased micropiles adjacent to the foundation wall. The micropiles were installed at a spacing of 6 feet, alternating between the interior and exterior of the foundation to reduce eccentricity on the piles. The micropiles consisted of 4-½ inch diameter elements reinforced with 38mm hollow reinforcing bars and 3-½ inch diameter J-65 steel casing.

The hollow bar and continuous grouting method was chosen to help keep the piles as close to the face of the wall as possible, again to reduce eccentric loads. Pilasters were supported by groups of micropiles with underpinning brackets. After the micropiles were installed, the general contractor excavated under the existing foundation in approximately 6-foot long sections and installed new footings and basement foundation walls.



Tom Printz, Printz Engineering Services, LLC, standing behind (and literally under) his design.

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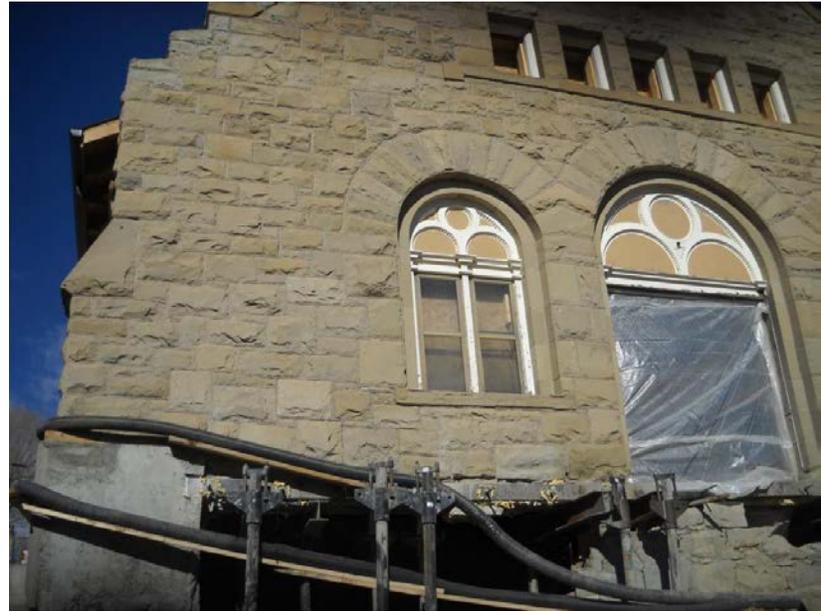
## CONCLUSION

Between the time excavation occurred and new foundations were constructed, the foundation below the excavated areas was supported completely by the micropile system.

The project received a prestigious American Council of Engineering Companies of Colorado (ACEC/CO) Engineering Excellence Award in 2011. By virtue of winning the Engineering Excellence Award, the project advanced to national competition in Washington D.C. in the spring of 2012.

This unique and challenging project highlights the capabilities and innovation provided by Straight Line Construction and Printz Engineering Services, LLC.

We stand behind (and under) our designs and construction. Let us help make your next challenging project as successful as the Mount Carmel Health, Wellness, and Community Center.



- Engineered Foundation Solutions
- Products Manufactured in the USA
- 50+ Locations Nationwide
- ICC-ES Recognized

