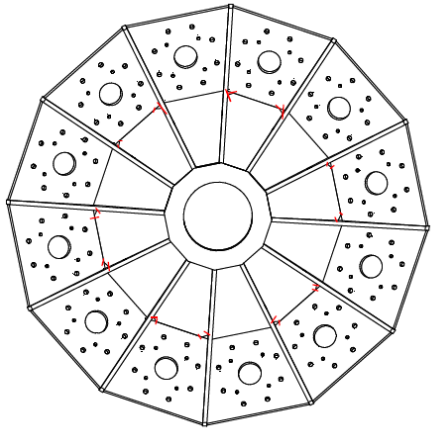
Innovative Approach to the First Use of a Steel Foundation Member

AMEC's Approach to Quality Ensures Client Satisfaction
Quality Auditors & Technicians Benefit our Clients

2011 AMEC Technical Summit

16 October 2011

R. Secrest, P.E.



Outline

I. Project Background

A. Construction of lattice transmission power line towers for Sempra Energy

B. AMEC's Role: Pile cap foundation inspection

II. AMEC Quality Program

A. AMEC Quality Auditors

B. AMEC Quality Assurance Technicians

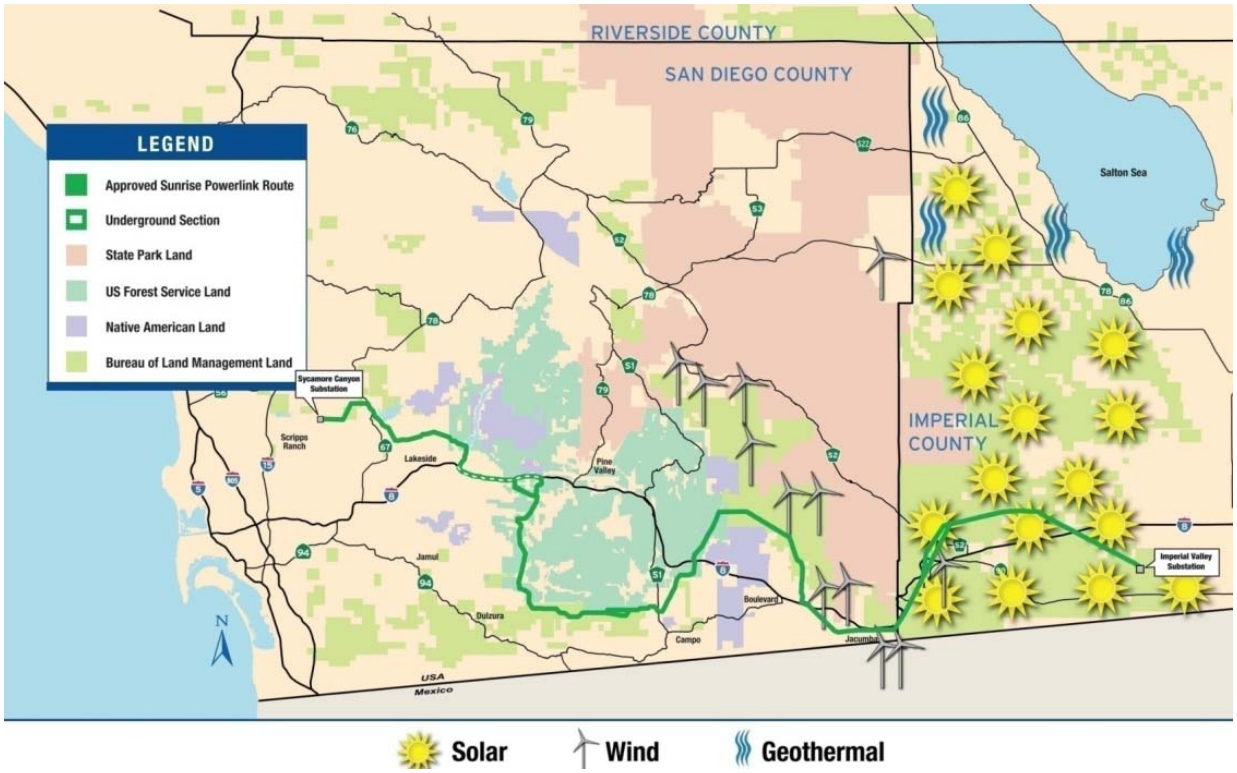
III. Results of the AMEC Quality Program

A. CLIENT SATISFACTION

B. First use of galvanized pile cap under lattice power line towers

I. Project Background – AMEC's Involvement

- AMEC Provides Quality Assurance
  - Fabrication and construction of certain components of the new power transmission line
    - Steel pile cap foundation member



I. Product – Steel Pile Cap

- Traditionally lattice towers are supported by concrete pile caps
  - Steel pile cap is a comparable alternative
    - Ideal alternative in remote environments
    - Production rate during fabrication: 12 pile caps per week

	Steel Pile Cap	Concrete Pile Cap
Construction Field Install Time	6 hours per cap	10 hours per cap
Helicopter Flights	5 per tower	9+ per tower

Overview – 3 Overall Topics

1. The effect of AMEC Quality Audits during fabrication.

2. The effect of utilizing AMEC Quality Program Personnel in the fabrication process.

3. The challenges and solutions developed for minimizing the effects of hot-dip galvanizing a steel pile cap.

II. Purpose of Quality Audits

- Conducted Quality Audits to Qualify
  - Steel fabricators
  - Suppliers
  - Rolling mills
- Clients Benefit from our Quality Audits
  - Highest possible quality products for our clients
  - Directly contribute to a successful product.
- Overall Benefit
  - Proven to increase product quality
  - Reducing rework
  - Saving time

II. Quality Audit Activities

- Auditor Activities
  - Review and comment on quality manuals
  - Conduct onsite audits
    - Quality control department
    - Fabrication shop floor
    - Interview workers
  - Draft comprehensive reports outlining findings
  - Follow-up on the implementation of audit results

II. Quality Assurance Technicians

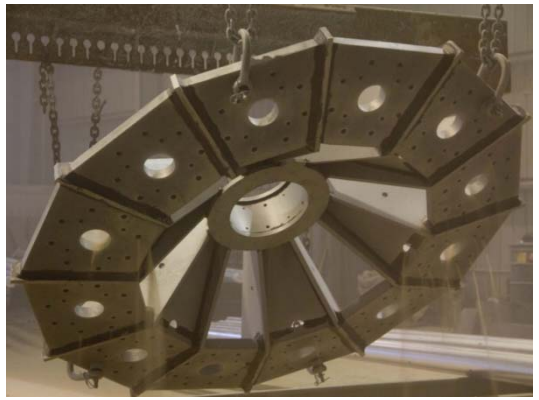
- The Effect of Utilizing Quality Assurance Technicians Includes
  - Improved weld profiles
  - A more consistent product
- Roles of Quality Assurance Technicians
  - Travel to the location of fabrication and provide
    - Quality assurance and inspection
    - Draft reports per contract requirements

II. Quality Assurance Technician Capabilities

- Review and Accept or Reject
  - Welder Qualifications
  - Material Test Reports (MTR)
  - Welding Procedure Specifications (WPS)
- Examine Welds
  - Visual Testing (VT)
  - Ultrasonic (UT)
  - Magnetic Particle (MT)
- Verify Coatings
  - American Society for Testing & Materials (ASTM)
  - Society for Protective Coatings (SSPC)
- Document
  - Daily observations
  - Testing activities

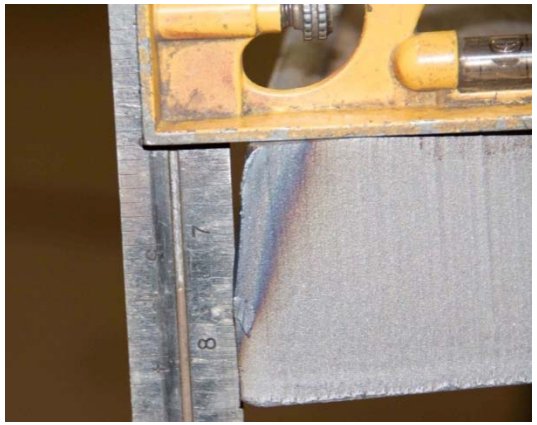
III. AMEC Quality Assurance Success Story

- AMEC Quality Assurance Personnel helped contribute to the first ever successful steel pile cap to be used under a lattice power line tower
  - Reviewed and provided comments on the Quality Manuals of pile cap fabricators
  - Conducted thorough Quality Audits of the fabricators
  - Deployed Certified Welding Inspectors (CWIs) onsite
    - Help ensure a quality product
  - Placed engineers onsite
    - Document galvanizing processes
    - Assist specification development



III. Result – First Use of Steel Pile Cap

- The Challenges and Solutions Developed for Successfully Galvanizing a heavily welded, highly Restrained Structural Foundation Element
  - Challenges
    - Significant thermal expansion of steel
    - Heavily welded pile cap
    - Highly restrained foundation element
  - Solutions Implemented
    - Full-time AMEC Quality Assurance Techs
      - To help improve weld profiles
    - Beveled and fully wrapped edges
      - To accommodate thermal expansion
    - Trial and Error
      - Hot-dip galvanizing in the horizontal configuration



III. Solutions that contributed to acceptance of the Steel Pile Cap

Beveled Edges and Fully Wrapped Welds
The edges of the bearing plates were beveled and the welds were fully wrapped around the bearing plates to accommodate the thermal stresses developed during galvanizing.

Horizontal Galvanizing
The steel pile cap achieved the most favorable results while being galvanized in the horizontal configuration.

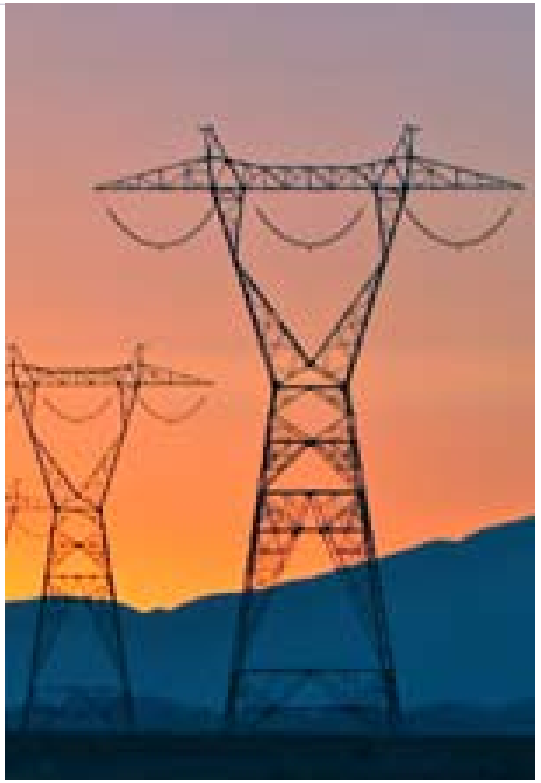
AMEC Quality Assurance
AMEC's quality assurance team helped contribute to an indication free steel pile cap.

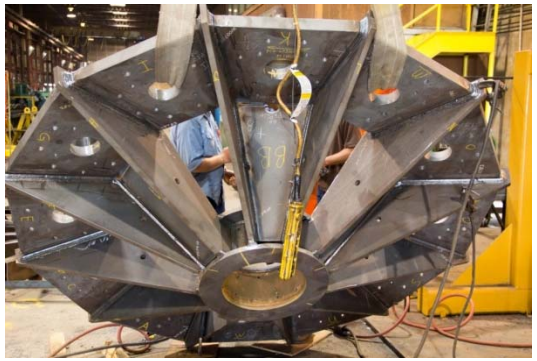
Weld Profile Control
Weld profiles were controlled to provide consistency which helps minimize stress risers in the final product.

- These four solutions helped contribute to the first known use of a steel pile cap under lattice towers for Sempra Energy.

III. Success Story – Result of AMEC's Quality Assurance Program

- Benefits of steel pile cap
  - Minimal environmental impact in sensitive wildlife areas
  - Carbon credits due to reduced flight hours
  - Minimizes field installation time
- Overall result
  - Cost and time savings
  - Reduced environmental impact





Questions