

SCOPE

This standard provides a guideline for electric distribution personnel to follow in preparing circuit improvement projects within the **High Fire Threat District**.

PURPOSE

- Reduce likelihood of the power distribution system being the cause of a fire event
- Reduce impact of power-line related fire
- Increase the ability of the distribution system to withstand wild land fire conditions
- Increase reliability in the backcountry areas

DEFINITIONS

Clear Recovery Zone (CRZ) – Area adjacent to unimproved roadways extending from the edge of driven way.

Edge of Driven Way (EDW) – On an unimproved roadway (without a concrete curb and gutter), the EDW is defined as follows:

1. If there is an asphalt berm, EDW is the edge of the berm farthest from the roadway.
2. If there is no berm but there is a white fog line, EDW is the edge of the fog line farthest from the roadway.
3. If there is no berm or fog line, EDW is the edge of the pavement.

High Fire Threat District Tier-2 – The broad area that has been determined by SDG&E to be at heightened risk for wild fire based on vegetation, land topology, and prevailing wind conditions. Boundaries are not generally changed.

High Fire Threat District Tier-3 – An area which designates a higher level of risk compared to areas within the **High Fire Threat District Tier-2**. Boundaries of the **High Fire Threat District Tier-3** may change annually.

Risk Matrix – Ranking spreadsheet evaluating multiple risk factors. This matrix is used to determine the order for project analysis.

Wireless Fault Indicator (WFI) – An overhead fault indicating device that senses and reports faults (along with load) with the ability to adjust the fault detection trigger point based on steady state load.

REFERENCES

1. Design Manual 5129 Distribution Phase Spacing
2. Design Manual 6111 Feeder Circuit Sectionalizing and Protection
3. Design Manual 6112 Overhead Service Restorer Application Criteria
4. Design Manual 6113 Automatic Self-Resetting Fault Indicator

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5. Design Manual 6121 Fuse Application Criteria
6. Electric Standard Practice 322 SEL Overhead Fault Indicators
7. Overhead Construction Standard 788 Hot Line Clamps and Stirrups
8. Overhead Construction Standard 1276 Overhead Autoranging Fault Indicator
9. Overhead Construction Standard 1600 Wildlife Protection

APPLICATION

The methods and procedures described herein apply to any distribution work (Reliability or Capacity) within the **High Fire Threat District Tier-2** that involves pole work or reconductor work.

PROCEDURE

1. Project Development
 - a. Initial analysis will be conducted on a circuit-section basis. Sections have been identified and reviewed by the key groups (District & Planning Engineers, Operations, Vegetation Management, Fire Coordinator, Environmental, and Cultural). The order of analysis will be determined by the risk matrix. Large sections may be divided into smaller sections to facilitate project development at the discretion of the District Engineer. Developed projects will then be prioritized for construction by the risk matrix. Prior to detailed engineering analysis, the study sections are to be fielded to confirm mapping accuracy and to evaluate exposure.
 - b. The recommended process is for the District Engineer to review the study segment for broad modification with input from the Planning Engineer. Detailed equipment review and change determination should be accomplished by a Project Designer, Electric Construction Supervisor, and Line Checker, or **Electric Troubleshooter** (ETS) under the direction of the District Engineer and O&E Manager.
 - i. District Engineer – broad engineering approach, considering:
 - Transfer load out of, and sectionalize along, **High Fire Threat District Tier-2 border and the border of portions of High Fire Threat District Tier-3 that are not adjacent to High Fire Threat District Tier-2.**
 - Cutover lower distribution voltages to 12kV, improving protection.
 - Evaluate adding additional phase conductor(s) to improve load balance.
 - Review capacitor installation (pad-mount, SCADA control, relocate).
 - Evaluate appropriate circuit hardening method.
 - Single stations off long branches:
 - 1) Notify Land Department of stations with no connected load.

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- 2) Evaluate loaded stations for possible off-grid solution.
 - Determine locations for fault indicators.
 - Determine switch locations and type.
 - Electronic sectionalizers – remove/replace with more advanced devices.
 - Review coordination for all protective devices.
 - ii. Line Checker/ETS/Designer/Construction Supervisor – detailed review, considering:
 - Replace transformers without pressure relief valves. Transformers installed prior to 1973 did not have pressure relief valves.
 - Replace porcelain insulators where wood construction is to remain.
 - Replace porcelain lightning arresters.
 - Replace hot line clamps connected directly to the line (i.e. without stirrups.)
 - Reconductor span(s) with more than three splices on the same phase in the span.
 - Spans with dissimilar conductors (size or material type).
 - Cutouts with solid blades – replace with "cutout style" 900 Amp disconnect switch (Stock number S707006) and WFI.
 - Initiate Engineering review for all spans where phase spacing/wire slop is a concern.
 - c. Project naming convention. For tracking data analysis purposes, name the projects as follows:
 circuit number:year_CFSP_description

 Description key: WS = wood to steel conversion
 TW = steel poles with tree wire
 SC = steel poles with spacer cable
 UG = traditional UG construction
 CIC = UG using cable in conduit construction
 Plus any other brief descriptive narrative needed

 Example: C440:2011_CFSP_WS, CIC, SCADA SWITCH (2)
2. General Considerations
- a. The goal is to maximize the effectiveness of the circuit hardening budget. For all construction options consider:
 - Rerouting the circuit and/or transferring loads to adjacent circuits.

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- Possible off-grid approach for small loads at the end of long branches.
- Cutover to eliminate 2400V and 4160V distribution.
- Elimination of boosters.
- Future expansion plans (review with the area Planning Engineer).
- Work with appropriate contact in District to review any specific concerns they might have (e.g. lines that are difficult to inspect and patrol, location of frequent outages, etc.).
- Elimination of light duty wire (lower tensile strength, i.e., #6 copper, #4 copper), especially in high wind areas.

b. Interdepartmental Coordination:

Contact must be made early in the process with Environmental Services, Land Services, Vegetation Management, and the Fire Coordinator for input and coordination. It has proven to be very beneficial to have all the interested groups (Engineering, Land, Design, Survey and Environmental) perform the initial detailed field survey together. If LIDAR data is to be incorporated submit the request early in the process as lead times for LIDAR data can be several months.

c. Fielding:

- Vehicles must stay on access roads. Vehicles must turn around in established or designated areas only.
- Avoid disturbing all vernal pools.
- Driving through drainage areas is okay.
- Parking or driving underneath oak trees is not allowed except in established traffic areas.
- Avoid ground disturbance in public areas.
- Contact Environmental Services for any questions regarding field work.

d. Avian Protection:

Check Overhead Construction Standard 1610 to determine if the area is in an Avian Protection Zone. Include required avian protection for proposed area of hardening in these zones.

3. Hardening Approach

The recommended construction approach, in general, is determined by the geographic/vegetation topology encountered:

Situation	Construction
High tree impact with suitable road ①	Convert to UG (paragraph 3.a.)
High tree impact with no useable roads	Hendrix Spacer cable on steel poles (paragraph 3.b.)

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Moderate tree impact with no useable roads	Tree wire on steel poles (paragraph 3.c.)
Low tree impact with suitable road	Convert to UG or steel pole bare-wire (paragraph 3.d.)
Other fire area construction	Steel pole bare-wire (paragraph 3.d.)

① San Diego County or Orange County maintained road.

a. Undergrounding

When the route for underground circuitry is established, contact Land Services to verify permitting and easement issues for the route chosen.

Note that a CRZ is required along unimproved roadways. The County of San Diego has a desired minimum CRZ of eight feet. Caltrans has a desired CRZ of 30 feet for high speed (>45 mph) roadways and 20 feet on conventional highways. For slopes greater than 1:4 (up or down) some jurisdictions do not enforce the CRZ. In these installations, facilities should be placed within the sloped area as far as possible from the EDW. When placing equipment, every attempt should be made to locate padmounted equipment and poles as far from the EDW as possible. Traffic bollards should not be placed on unimproved roadways. Visibility strips should be placed on equipment.

If the equipment is not readily visible or may be obscured by vegetation, traffic bollards may be placed near the equipment as long as they are designed to break away and have visibility strips on them. Bollards may not be placed within eight feet of the EDW.

b. Spacer Cable (1/0 aluminum, 336 aluminum, 636 aluminum)

Spacer cable has many advantages over standard open wire construction. These include greater strength, insulated cable protection, compact construction and capability for longer spans.

This option is less aesthetically pleasing due to the unusual configuration and should be avoided in residential or urban areas with significant traffic.

c. Tree Wire (1/0 ACSR, 336 ACSR, 636 ACSR)

Tree wire is a useful option in areas where there is the possibility of incidental contact (palm fronds, small tree limbs, birds etc.) and where spacer cable would be visually obtrusive. The increased strength of spacer cable (nearly twice that of tree wire), is preferred in areas where contact with heavy limbs or entire trees is possible, even if all required tree trimming is done.

d. Conductor Sizing

Conductor sizes for overhead construction will be based on required strength for the **High Fire Threat District Tier-2** and **High Fire Threat District Tier-3**. Electrical loading is not the sole consideration.

Feeder: Utilize 336 ACSR or 636 ACSR depending on current and future loading needs, and tie capacity (check with Distribution Planning for information on future loads and tie capacity).

Branch:

i. Bare Wire: Utilize #2 5/2 Alumoweld Aluminum Conductor (AWAC) for branches equal to and below

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5000-foot elevation. Utilize #2 3/4 AWAC for branches over 5000-foot elevation. The AWAC conductor provides greater tensile strength than the ACSR due to its multiple steel stranding and Alumoweld composition.

ii. Insulated Wire (Spacer Cable, Tree Wire): Use 1/0 for all insulated-wire branches.

e. Re-Routing

Consider re-routing lines when there is an opportunity to lower fire risk or to improve reliability and maintenance access. Re-routing refers to a minor or major change in current alignments. Typical re-routes involve moving equipment closer to accessible roads and away from trees and vegetation, or out of cross-country runs.

f. Equipment Considerations

i. SCADA Operated Switching/Service Restorer (Recloser)

Verify Sensitive Ground Fault (SGF) protection is enabled on any upstream service restorer (SR). If the SR is an older model that does not allow SGF protection, remove or replace. If the SGF setting is greater than 10 amps, review the segment for load balancing, to enable SGF of 10 amps or less, once balanced.

Check for the amount of OH exposure downstream of a SCADA SR or other fault interrupting device. Install SCADA operated sectionalizing in areas where there is more than **one mile** of three-phase OH exposure between existing SCADA sectionalizing devices.

ii. Switches

Ensure sufficient switching per DM 6111 (no more than one mile between switching devices).

iii. Overhead Transformers

Identify all 7200V WYE transformers in the proposed area to be hardened and replace them with 12.0 kV line-to-line transformers, except where there is single-phase construction only and installing a second phase is cost prohibitive. Changing the transformers for line-to-line operation will help to balance load, allowing reduction of the SGF settings and may allow for smaller fuses. Customer voltage will be somewhat higher, but still within limits.

Transformers **without** pressure relief valves **shall** be replaced. **Transformers installed prior to 1973 did not have pressure relief valves.**

iv. Capacitors

Evaluate the existing capacitors with the area Planning Engineer to determine the need to retain. Overhead capacitors have been identified as the most problematic device in rural distribution.

Evaluate circuit modifications that would facilitate capacitor bank elimination or relocation. (In wood-to-steel areas, the increase in conductor size may allow removal. Confirm with Distribution Planning.)

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If the area is subject to extreme winds and/or heavy vegetation, replace existing capacitors with SCADA controlled capacitors or review for possible pad-mount SCADA capacitor application. Consider relocation of overhead banks to areas of lesser risk, preferably a paved area.

v. Regulators

Review all proposed regulator installations with the area Planning Engineer. All new regulators will include SCADA.

vi. Fuses

Review fusing on the segment and upstream devices for compliance with DM 6121. The objective is fire risk reduction, and this may require that some devices will not coordinate. Consult with the Fusing Specialist.

Replace expulsion fuses with SMU-20 type fuses.

vii. Fault Indicators

Analyze circuit for fault indication – non-fused cable poles, long un-fused branches, or downstream of any un-fused branch, or areas where patrol may be difficult due to terrain, etc., or on the feeder where fault interrupting devices may be mis-coordinated. WFIs may be used in all areas, including where steady state load is five Amps or less at all times.

When considering a location for a WFI, LPCN communication coverage should be confirmed with the C&O District Engineer. If communication is not present, contact Electric Distribution Engineering for assistance. (See Electric Standard Practice 322 for installation guidelines.) All manually operated, normally closed switches should include a WFI.

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