



AUTOMATED PRELIMINARY SCREENING

Coordination & Selectivity Review

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Prepared for	[REDACTED]
Job ID	SAMPLE-CO-01
Order ID	SAMPLE — redacted production test run
Review type	Automated release

AT A GLANCE — 16 FINDINGS

4 CRITICAL	12 SIGNIFICANT	0 OBSERVATION	0 INFORMATION
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EXECUTIVE SUMMARY

What to look at first

16 findings across 2 severity levels — full detail begins on the following page.

SEVERITY DISTRIBUTION



PRIORITY SHORTLIST

- CO-OVL-03-4 · overlap
SWBD-02: instantaneous is enabled on both devices at the same 8000 A pickup
- CO-OVL-03-5 · overlap
SWBD-01: upstream instantaneous at 17,500 A is reachable by the available fault current
- CO-CODE-03-10 · code requirement
No arc energy reduction method identified on any device
- CO-CFG-01-12 · configuration
Coordination evaluated in one configuration; the arc flash section evaluated two

BY CATEGORY

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overlap	7
code requirement	4
configuration	2
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Coordination & Selectivity Review

Job SAMPLE-CO-01 · Order SAMPLE — redacted production test run · Automated release

SAMPLE — redacted. Client name, address, personnel and contact details removed; equipment tags, manufacturer and model names pseudonymised. Engineering findings unchanged.

Read before relying on anything below.

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Submission details

Report	Coordination & Selectivity Review — Report CO-01
Submittal reviewed	[coordination and arc flash study].pdf — Revision 01, 11 September 2019 (52 pages)
Client identity	Redacted for public release

CRITICAL (4)



CO-OVL-03-4 · overlap · issue

Critical

SWBD-02: instantaneous is enabled on both devices at the same 8000 A pickup

This is the highest-priority verification item in this report.

- Upstream SWBD-02-FB: INST (1600 A) = 4 (8000 A), with INST OR Fixed (17500 A)
- Downstream SWBD-02-MB: INST (2–12 × P) = 4 (8000 A)
- Available fault current at SWBD-02: 29,153.67 A three-phase

Both devices have instantaneous enabled, both at a declared pickup of 8000 A, and the available fault current at the bus is roughly 3.6 times that pickup. A fault anywhere on the load side of SWBD-02-MB at a current the bus can supply is above both instantaneous pickups.

Instantaneous overlap is the most common cause of lost selectivity and it is frequently invisible in a summary table — which is precisely what happened here, since the study's own coordination narrative (finding 8) does not mention it.

This pair requires verification against manufacturer curve data. Instantaneous response is fast and the two devices' actual clearing behavior at 29 kA depends on let-through characteristics this review does not evaluate.

Driving input: upstream INST 8000 A; downstream INST 8000 A; available fault current 29,153.67 A at SWBD-02

RECOMMENDED ACTION

Verify this pair first. If instantaneous is not required on the upstream device for equipment protection, disabling it or raising its pickup above the downstream device's let-through is the conventional resolution — but that is a design decision for the Engineer of Record, and it interacts with the incident energy results in report AF-06.

Source: page 28 — Appendix B, "SWBD-02 (SERIES BREAKERS)" TCC, settings blocks, p. 28; Appendix A / one-line, SWBD-02 bus, 3P 29153.67 A

Code ref: none — general observation

Confidence: medium

CO-OVL-03-5 · overlap · issue

Critical

SWBD-01: upstream instantaneous at 17,500 A is reachable by the available fault current

- Upstream SWBD-01-FB: INST Fixed (17500 A) — fixed, not adjustable
- Downstream SWBD-01-MB: INST = 4 (8000 A)
- Available fault current at SWBD-01: 29,175.76 A three-phase

The upstream instantaneous pickup is fixed at 17,500 A and the bus can supply 29,176 A, so the upstream instantaneous is reachable by a fault on the downstream device's load side. Because the upstream pickup is a fixed characteristic, this cannot be resolved by adjustment — it is a property of the MCCB (Type 3) trip unit TU-1 as applied.

This pair requires verification against manufacturer curve data.

Driving input: upstream INST Fixed 17500 A; downstream INST 8000 A; available fault current 29,175.76 A at SWBD-01

RECOMMENDED ACTION

Verify against manufacturer curves. Note that the upstream device's instantaneous is fixed, which limits the available remedies.

Source: page 27 — Appendix B, "SWBD-01 (SERIES BREAKERS)" TCC, settings blocks, p. 27; Appendix A / one-line, SWBD-01 bus, 3P 29175.76 A

Code ref: none — general observation

Confidence: medium



CO-CODE-03-10 · code requirement · issue

Critical

No arc energy reduction method identified on any device

No arc energy reduction method appears anywhere in the coordination scope — not in the settings blocks, not in §3, not in the executive summary. The system contains multiple 2000 A devices (SWBD-01-FB, SWBD-01-MB, SWBD-02-FB, SWBD-02-MB) plus the main distribution and generator breakers.

Whether the provisions apply depends on an ampere threshold that varies by adopted edition, and no code document was supplied, so this review states no threshold. What can be said is that 2000 A devices sit above any threshold used in recent editions and no method is identified for any of them.

This finding connects directly to report AF-06: the four buses above 40 cal/cm² in this facility (ATS-01 FB at 100, GEN-02 at 73, PNL-05 at 71, SWBD-03 at 61 cal/cm²) all derive from clearing times capped at 2 seconds. An energy-reducing method is the conventional remedy and none is present.

RECOMMENDED ACTION

Determine whether the adopted edition requires a method on these devices, and evaluate whether one can be added — particularly at the four above-40 buses.

Source: page 27 — Appendix B settings blocks pp. 27–48 (no reduced-mode entry on any device); §3 Overcurrent Device Coordination, pp. 6; §1.3 Study Highlights

Code ref: none — general observation

Confidence: medium

CO-CFG-01-12 · configuration · issue

Critical

Coordination evaluated in one configuration; the arc flash section evaluated two

The arc flash section of this same document evaluates two source scenarios — (*S0) UTILITY and (*S1) GENERATOR — and finds that the generator case governs at UPS-A1-SWBD and LP-01 (see report AF-06, finding 16).

The coordination section evaluates one. §3 describes the general procedure and Appendix B presents plots with no scenario designation. Nothing states which source configuration the TCC plots represent, and nothing addresses coordination on generator.

The one-line makes the configurations concrete: it shows SWBD-TIE, Open SWBD-02-FB, Open SWBD-02-MB, Open GEN-SWBD-01-MB, Open PNL-05-MB, Open UPS-A1-BYP-MB and Open UPS-B1-BYP-MB — a system with a tie and multiple normally-open devices, meaning several distinct operating configurations exist. Selectivity in normal operation says nothing about selectivity on generator or with the tie closed.

RECOMMENDED ACTION

Evaluate coordination in the generator configuration and with the tie closed, or state which configuration the plots represent and which are excluded.

Source: page 6 — §3 Overcurrent Device Coordination, p. 6; Appendix B plots (no scenario designation); one-line p. 7 showing SWBD-TIE and the normally-open devices; Appendix C scenario legend (*S0) UTILITY / (*S1) GENERATOR, p. 51

Code ref: none — general observation

Confidence: high

SIGNIFICANT (12)



CO-SET-01-1 · completeness · issue

Significant

Settings exist only on TCC plots; there is no settings table

Appendix B presents settings as blocks printed alongside each TCC curve. There is no consolidated protective device settings table anywhere in the 52-page document.

The consequences are practical rather than cosmetic:

- Devices appear in the settings blocks only if a TCC was plotted for them. Appendix C names roughly 38 protective devices; Appendix B carries settings blocks for a smaller subset. A device with no plot has no settings recorded anywhere in this document.
- The settings cannot be sorted, compared across the system, or handed to a technician as a commissioning checklist.
- There is no single place to confirm what was actually implemented.

RECOMMENDED ACTION

Publish a tabulated settings table covering every device in Appendix C, not only those with plots.

Source: page 26 — Appendix B, pp. 26–48 — TCC plots with adjacent settings blocks; the absence of a settings table anywhere in the table of contents (p. 2)

Code ref: none — general observation

Confidence: high

CO-OVL-01-2 · overlap · issue

Significant

SWBD-01: upstream and downstream long-time pickups are both 2000 A

SWBD-01-FB (upstream) and SWBD-01-MB (downstream) are both 2000 A trip, 2000 A plug, and both have their long-time pickup set to the full 2000 A:

- Upstream SWBD-01-FB: Plug Adj (1000–2000 A) = 2000 A, LTD = Fixed
- Downstream SWBD-01-MB: LTPU ($0.4\text{--}1.0 \times P$) = 1 = 2000 A, LTD (2–24 s) = 7

The upstream long-time pickup is therefore at the downstream pickup, not above it. The upstream long-time delay is a fixed characteristic while the downstream is set to band 7, so the two long-time curves are not offset by a settable margin at the pickup.

This pair requires verification against manufacturer curve data. The MCCB (Type 3) trip unit TU-1 fixed long-time characteristic and the LVPCB (Type 1) trip unit TU-2R band 7 characteristic may or may not separate adequately in the region of interest — that is a curve question this review does not answer. What can be said is that the declared settings provide no pickup margin.

The plot itself is titled "SWBD-01 (SERIES BREAKERS)", which suggests the study recognized the pairing.

Driving input: upstream Plug Adj 2000 A and LTD Fixed; downstream LTPU 2000 A and LTD 7

RECOMMENDED ACTION

Verify this pair against the manufacturer curves for the MCCB (Type 3) trip unit TU-1 and LVPCB (Type 1) trip unit TU-2R at the fault currents available at SWBD-01 (29,176 A three-phase).

Source: page 27 — Appendix B, "SWBD-01 (SERIES BREAKERS)" TCC, settings blocks for SWBD-01-FB and SWBD-01-MB, p. 27

Code ref: none — general observation

Confidence: medium



CO-OVL-01-3 · overlap · issue

Significant

SWBD-02: upstream and downstream long-time settings are identical

SWBD-02-FB (upstream) and SWBD-02-MB (downstream) are both 2000 A trip, 2000 A plug, with:

- Upstream SWBD-02-FB: LTPU = H (2000 A), LTD = 7
- Downstream SWBD-02-MB: LTPU = 1 (2000 A), LTD = 7

Both pickup and delay band are identical between the upstream and downstream device. This is a tighter version of finding 2 — there is no declared margin at all in the long-time region, in either pickup or delay.

The devices are different trip units (MCCB (Type 2) trip unit TU-3 / TU-3R upstream, LVPCB (Type 1) trip unit TU-2 / TU-2R downstream) so their curves are not identical even at identical settings, and the manufacturer data may show separation. This pair requires verification against manufacturer curve data.

Driving input: upstream LTPU H (2000 A) / LTD 7; downstream LTPU 1 (2000 A) / LTD 7

RECOMMENDED ACTION

Verify against the manufacturer curves at the fault currents available at SWBD-02 (29,154 A three-phase).

Source: page 28 — Appendix B, "SWBD-02 (SERIES BREAKERS)" TCC, settings blocks for SWBD-02-FB and SWBD-02-MB, p. 28

Code ref: none — general observation

Confidence: medium

CO-OVL-02-6 · overlap · issue

Significant

SWBD-02-FB short-time delay is set to "Inst."

Upstream SWBD-02-FB carries STD, (FLAT) Inst. — the short-time delay is set to its instantaneous (shortest) position, at a short-time pickup of 8000 A. The downstream SWBD-02-MB carries STD (0.1–0.5 Sec.) 0.1 (I²t On).

An upstream short-time delay set to its minimum, above a downstream device with a 0.1 s short-time delay and I²t on, is the condition this check looks for: the upstream band is at or below the downstream band in the short-time region.

This pair requires verification against manufacturer curve data.

Driving input: upstream STPU 4X (8000 A) with STD FLAT/Inst.; downstream STPU 4 (8000 A) with STD 0.1 s I²t On

RECOMMENDED ACTION

Verify. Combined with finding 4, the SWBD-02 pair has no declared margin in the long-time, short-time or instantaneous region.

Source: page 28 — Appendix B, "SWBD-02 (SERIES BREAKERS)" TCC, settings blocks, p. 28

Code ref: none — general observation

Confidence: medium



CO-OVL-04-7 · overlap · issue

Significant

Ground fault protection exists at multiple levels and is reported at one

§1.3.2 states: "The ground fault trip unit on the existing SWBD-01-FB located in SWBD-03 has a limited range of available settings, and is therefore incapable of selectively coordinating with downstream breakers. This may be seen in the 'GROUND FAULT' TCC."

The study therefore knows ground fault protection exists at more than one level and has identified a coordination concern at one of them. What it does not provide is ground fault pickup and delay for each level. The settings blocks reproduced in Appendix B are headed "Settings Phase" and carry phase settings only. Appendix C's arc flash table carries a Ground column reading Yes on essentially every row, which confirms ground fault protection is widespread in the system, but carries no settings.

Ground fault coordination is routinely omitted from studies that treat phase coordination carefully, and this is that pattern.

RECOMMENDED ACTION

Report ground fault pickup and delay for every level, alongside the phase settings.

Source: page 4 — §1.3.2 Coordination Results, p. 4; Appendix B settings blocks, all headed "Settings Phase"; Appendix C Ground column, pp. 49–51

Code ref: none — general observation

Confidence: high

CO-CODE-02-8 · code requirement · issue

Significant

The coordination conclusion is stated in terms that cannot be checked

§1.3.2 in full, on the normal distribution: "Normal distribution is not code required to be selectively coordinated. However, coordination of these normal power distribution systems allows for more reliable day-to-day operation of the electrical distribution system. There are a few concerns with the selective coordination on this site. The ground fault trip unit on the existing SWBD-01-FB ... is therefore incapable of selectively coordinating with downstream breakers."

"A few concerns" is quantified as exactly one — the SWBD-01-FB ground fault trip unit. The narrative states no current range and no time range over which any coordination claim holds, and it does not mention the phase-side items in findings 2 through 6, all of which are visible in the same appendix the narrative points the reader to.

The result is a summary that a reader will take as "one ground fault issue, otherwise fine," when the declared settings on the two main distribution pairs carry no margin in any region.

RECOMMENDED ACTION

State the coordination claim with its current and time range, and either address the phase-side items or state that they were evaluated and accepted.

Source: page 4 — §1.3.2 Coordination Results, p. 4; Appendix B settings blocks pp. 27–28

Code ref: none — general observation

Confidence: high



CO-CODE-01-9 · code requirement · issue

Significant

The classification determination is asserted with no supporting basis

§1.3.2 states: "NEC 700.27 requires selective coordination for Emergency Systems. There are no portions of the electrical distribution system that have this classification; therefore, no part of this system is required by code to selectively coordinate."

The determination may well be correct for this facility. What the study does not provide is any basis for it. The system contains GEN-01, GEN-02, GENERATOR 01, ATS-01 FB, GEN-01-ATS, and what §1.3.3 calls "the utility breaker feeding the house ATS" — a generator-backed distribution with automatic transfer. Nothing in the document identifies the building's egress lighting, fire alarm, fire pump, or other life-safety loads, or states where they are fed from, or establishes that none of them falls under an emergency or legally required standby classification.

A one-sentence negative determination on classification, with no load inventory behind it, is the kind of conclusion an AHJ will ask about.

RECOMMENDED ACTION

Document the basis — a load inventory identifying what is fed from the generators and how each load is classified.

Source: page 4 — §1.3.2 Coordination Results, p. 4; one-line showing GEN-01, GEN-02, GENERATOR 01, ATS-01, GEN-01-ATS, p. 7

Code ref: none — general observation

Confidence: medium

CO-CODE-04-11 · code requirement · issue

Significant

No reduced-setting mode documented

No maintenance mode, energy-reducing maintenance setting, or zone-selective interlocking appears in any settings block. Correspondingly, no reduced-mode coordination consequence is discussed.

Recorded separately from finding 10 because the two are different questions: finding 10 asks whether a method is required, this one records that if a method exists in the field it is not documented here, and that the coordination consequences of engaging one have not been evaluated. Engaging a reduced mode frequently destroys selectivity, which is an accepted tradeoff that should be stated rather than discovered.

RECOMMENDED ACTION

If any device has a reduced mode, document both settings states and the coordination consequence of the reduced one.

Source: page not applicable — Appendix B, all settings blocks — each shows one settings state only

Code ref: none — general observation

Confidence: high



CO-CFG-03-13 · configuration · issue

Significant

Coordination checked at maximum fault current only

Nothing in §3 or Appendix B addresses coordination at minimum available fault current. §2 is explicit that the short circuit analysis calculates "the maximum available three-phase, RMS symmetrical, short-circuit amperes at each piece of equipment", and §2.2.2 states cable resistance was modeled at 25 °C specifically because that produces the higher fault current.

Devices that coordinate at high fault current can lose selectivity in the long-time region at low current, and the long-time region is where findings 2 and 3 sit.

RECOMMENDED ACTION

Check the pairs in findings 2 and 3 at minimum fault current as well as maximum.

Source: page 4 — §2.1 General Procedure, p. 4; §2.2.2 Cable Data, p. 5; §3, p. 6

Code ref: none — general observation

Confidence: high

CO-SET-05-14 · completeness · issue

Significant

Settings are not designated as-found, as-designed or as-recommended, and there is no implementation record

§3.1 describes the coordination analysis as one that "determines the suggested settings and, where appropriate, the ampere ratings and types." The settings blocks in Appendix B carry no designation — nothing marks them as found in the field, as designed, or as recommended.

There is no implementation record anywhere: no statement that recommended settings were confirmed in the field, no verifier, no date.

The cover disclaimer states that "adjustment of protective device settings ... may invalidate these results", which makes the distinction load-bearing. A study whose settings were never applied documents an intention rather than the installed system, and this document does not say which it is.

RECOMMENDED ACTION

Designate each device's settings basis and record implementation — who set them, when, and verified against what.

Source: page 6 — §3.1 General Procedure, p. 6; Appendix B settings blocks (no basis designation); cover page disclaimer

Code ref: none — general observation

Confidence: high

CO-DOC-01-15 · documentation · issue

Significant

TCC plots predate the report by ten months, and no one-line revision is cited

Two related traceability gaps:

RECOMMENDED ACTION

Confirm the plots reflect the system at the report date, and cite the one-line by number and revision.

Source: page 27 — Appendix B TCC title blocks dated November 27, 2018, pp. 27-28 and following; cover date September 11th, 2019; §1.1 p. 3; §5 p. 7

Code ref: none — general observation

Confidence: high



CO-OVL-05-16 · overlap · issue

Significant

Transformer withstand, conductor damage and motor inrush are not addressed

None of the three appears anywhere in §3 or Appendix B:

RECOMMENDED ACTION

Address all three, particularly conductor damage protection if the delays in findings 2, 3 and 6 are extended to resolve them.

Source: page 6 — §3 Overcurrent Device Coordination, pp. 6 — the section where such discussion would appear; Appendix B plot titles, none of which reference a damage curve, inrush point or motor start

Code ref: none — general observation

Confidence: high