Project Horizon: WCAG 3.0 APCA & Norteño-Spanish Linting

Empirical Optical Telemetry Under 100,000+ Lux Yuma Desert Glare & Air-Gapped .imscc Screen-Reader Auditing

`WCAG 3.0 APCA • $8,850 R&D`

In Plain English (Executive Summary):
Before you read the technical methodology below, here is the short version: **Legacy WCAG 2.x 4.5:1 contrast formulas ignore font weight, spatial frequency, polarity, and extreme outdoor sunlight (>100,000 lux in Yuma, Arizona).** *Project Horizon* establishes an air-gapped R&D testbed in the **AWC Regional Center for Emerging Technology / Entrepreneurial College** to benchmark the **W3C WCAG 3.0 Accessible Perceptual Contrast Algorithm (APCA Bronze / Silver / Gold)** on real student mobile screens while validating regional **Norteño-Spanish** diacritics and screen-reader phonetics in batch Canvas `.imscc` course packages.

1. The Optical Limitation of Legacy 4.5:1 Contrast Under Desert Sunlight

Across community colleges in the Desert Southwest (Yuma, AZ and Imperial Valley, CA), first-generation and working students frequently access Canvas LMS and Open Educational Resources (OER) on budget Android and iOS mobile viewports in high-glare environments (transit stops, agricultural fields, and outdoor athletic facilities exceeding **100,000 lux** ambient illuminance).

While WCAG 2.1/2.2 Level AA mandates a flat `4.5:1` relative luminance ratio, human visual perception depends heavily on **spatial frequency** (stroke width and font size), **polarity** (dark-on-light vs. light-on-dark), and **ambient veil glare**. Under Project Horizon, all EXW Master Library modules already enforce a minimum **9:1 Double-Contrast Guard** while empirically mapping the **W3C WCAG 3.0 Working Draft APCA Lightness Contrast (L_c)** tiers:

WCAG 3.0 APCA Tier	Target L_c & Luminance Standard	Project Horizon Field & Lab Verification Protocol
Bronze Level (Baseline Compliance)	APCA $L_c \geq 60$ for body copy; 100% automated ADA Title II WCAG 2.2 AA pre-commit gate.	Automated pre-commit linting across `.md`, `.html`, and `.imscc` Canvas exports before any page reaches production.
Silver Level (Enhanced Mobile Readability)	APCA $L_c \geq 75$ for body copy + EXW `9:1` Double-Contrast Guard (`#0F172A` on `#FFFFFF` = `17.1:1`).	Verified across budget Android smartphones, Android tablets, legacy iPhone SE small viewports, and standard iOS devices.
Gold Level (100,000+ Lux Desert Glare)	APCA $L_c \geq 90$ + spatial-frequency font-weight calibration + optical colorimeter profiling.	Empirical luminance and ambient lux telemetry captured via digital lux photometer (`100,000+ lux`) and dual calibrated 4K reference monitors.

2. Norteño-Spanish Screen-Reader Phonetics & W3C SKOS Controlled Vocabulary

As a federally designated Hispanic-Serving Institution (HSI), Arizona Western College serves a bi-national student population fluent in regional **Norteño-Spanish**. When generic translation tools or unverified HTML pages omit Spanish `lang="es"` attributes, strip diacritics (`á, é, í, ó, ú, ñ`), or mix raw LaTeX notation into plain text, mobile screen readers (VoiceOver and TalkBack) mispronounce clinical words using English phonetic engines.

- **Automated Diacritic & Lang-Tag Linting:** Project Horizon's air-gapped edge linter (co-reviewed with the **AWC Modern Languages Department**) scans `.imscc` Common Cartridge XML/HTML manifests to enforce explicit language switching and proper Spanish orthography.
- **W3C SKOS Bilingual Clinical Taxonomy (`exw:AWCBorderlandClinicalTaxonomy_v2_2`):** Maps regional Norteño expressions (e.g., *calorón de Yuma*, *prueba del habla*, *frena el pulso*) to canonical federal SSoT definitions in *PAGA 2018*, *DGA 2025–2030*, and *ACSM 12th Ed.*
- **Plain-Text LaTeX Sanitization (`strip_plain_text_latex()`):** Converts raw math strings (such as `$\text{H}^+$` or `$\ge$`) into screen-reader-friendly words (*iones de hidrógeno (H+)* / *al menos*).

3. Air-Gapped Zero-Trust Architecture & Zero Recurring Cost Sustainability

Hosted in the **AWC Regional Center for Emerging Technology / Entrepreneurial College**, the Project Horizon testbed operates **100% offline at the build layer** (`>= 16-core CPU`, `64GB DDR5 RAM`, `>= 16GB VRAM GPU` running local quantized open-weight models). It requires **zero production Canvas LMS API modifications, zero student PII exposure (`100% FERPA-safe`), and `$0.00` in recurring SaaS or token fees**.

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