

Formula 1

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Formula 2

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Detailed Explanation

The protocol integrates regulatory requirements from two foundational standards: OSHA 1910.212 mandates that point-of-operation guarding must prevent employee contact with hazardous motion, while ISO 13857 specifies minimum safety distances (e.g., reach, squat, and jump distances) based on anthropometric data and access speed to ensure guarded zones remain inaccessible during machine cycles. A compliant audit evaluates not only static fixture geometry—such as clamp placement, jaw protrusion, and part containment—but also dynamic interactions, including part ejection forces, vibration-induced loosening, and robotic cell envelope overlaps. Critical attention is given to worst-case scenarios: maximum operator reach under fatigue or distraction, simultaneous multi-axis motion, and failure modes like single-point clamp release. The audit process typically follows a five-phase methodology: (1) hazard identification via task analysis and risk matrix (e.g., ISO 12100), (2) dimensional verification against ISO 13857 tables (e.g., Type I vs. Type II openings), (3) functional testing of retention force and repeatability (per ASTM F2946 or internal torque/force thresholds), (4) documentation traceability (fixture ID, revision, validation date), and (5) corrective action tracking with root-cause classification (design, procedural, or training-related). Ultimately, the protocol transforms passive fixture specifications into active safety controls—ensuring workholding functions as an integral part of the machine’s safeguarding system rather than merely a production enabler.

Key Components

#	Component
1	Hazard Zone Mapping & Safety Distance Validation

#	Component
2	Clamp Retention Force & Repeatability Verification
3	Fixture Failure Mode Analysis (FMEA) for Unintended Release

Applications

#	Application
1	Pre-deployment validation of CNC fixturing in aerospace manufacturing
2	Annual safety recertification of robotic welding jigs in automotive plants
3	Third-party audit preparation for ISO 45001 or ANSI B11.19 certification

Related Concepts

#	Concept
1	Machine Guarding Hierarchy (Elimination ? Prevention ? Protection)
2	Anthropometric Design Envelopes
3	Functional Safety Integrity Level (SIL) for Integrated Fixtures

Tags

machine_safety, fixture_design, compliance_auditing

Workholding Safety Audit Protocol (OSHA 1910.212 + ISO 13857)