



Inspection Integrity Innovation

Written by: Budagatla Satish

**A World-Class, Comprehensive Manual  
Developed by CBM 360 TIV - Operating Procedure & Technical  
Inspection Framework for Copper & Cobalt Mining Operations  
(Open-Pit & Underground)**

CBM 360 TIV (Condition-Based Monitoring 360 Technical Industrial Verification, UK) presents a **structured, comprehensive operating procedure and technical guideline manual** designed for the **Copper & Cobalt mining-to-refining value chain**, covering both **open-pit and underground mines**, as well as associated processing and engineering departments.

This manual provides **structured methodologies, inspection protocols, audit checklists, and compliance guidelines** to ensure the **integrity, reliability, safety, and performance** of assets across the full operational spectrum.



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## CBM 360° TIV – Global Leader in Testing, Inspection & Verification

### Objective

To ensure **asset reliability, safety, compliance, and operational efficiency** across the full mining-to-refining value chain.

### Scope

- **Mining Operations:** Open-pit & underground mines
- **Processing Facilities:** Concentrator, crushing & conveyor systems, smelter, refinery, acid plant, tailings leach plant (TLP), oxygen plant
- **Engineering Services:** Mechanical, electrical & automobile departments

### Approach

CBM 360 TIV applies an integrated methodology that combines:

- **Condition-Based Monitoring (CBM)**
- **Non-Destructive Testing (NDT)**
- **Asset Integrity Management**
- **Technical Industrial Verification (TIV)**

All services are aligned with **UK, EU, and international standards**, ensuring global compliance, optimized performance, and sustainable operations



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## Company Profile

**Founded in 1992 in the United Kingdom**, CBM 360 TIV has grown into a trusted global partner in **Testing, Inspection, Certification, Condition-Based Monitoring, and Verification services**.

- **Regional Headquarters:**

- Dubai (Middle East & Africa)
- Hong Kong (Asia)
- Brazil (North & South America)

- **Global Presence:**

Operating across **72 countries**, CBM 360 TIV supports industries with a **commitment to safety, quality, and sustainability**.

## Global Team & Network

- **7,000+ professionals** worldwide
- **25 advanced laboratories**
- **72 branch offices** across strategic industrial hubs

Our multidisciplinary experts work closely with clients to:

- Enhance operational performance
- Extend asset life cycle
- Ensure compliance with **international standards & regulations**



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## Industry Coverage

CBM 360 TIV goes **beyond compliance** by delivering **innovative, data-driven solutions** to industries including:

- Mining & Metals (Copper, Cobalt, Iron, Gold, Rare Earths)
- Oil & Gas (Onshore/Offshore, FPSO, Refineries, Petrochemicals)
- Power Generation & Utilities
- Marine & Offshore
- Infrastructure & Manufacturing

## Our Brand Values

Built on **trust, integrity, and technical excellence**, CBM 360 TIV combines **global expertise** with **local presence** to help organizations achieve the highest standards of:

- Quality
- Safety
- Environmental protection
- Social responsibility

**CBM 360 TIV – Ensuring Reliability. Driving Innovation. Building Confidence.**



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## 1. Introduction

- **Objective:** To ensure **asset reliability, safety, compliance, and operational efficiency** across the full mining-to-refining value chain.
- **Scope:** Open-pit & underground mines, concentrator, crushing & conveyor systems, smelter, refinery, acid plant, tailings leach plant, oxygen plant, mechanical, electrical & automobile engineering departments.
- **Approach:** CBM 360 TIV applies **Condition-Based Monitoring (CBM), Non-Destructive Testing (NDT), Asset Integrity, and Verification** aligned with UK, EU, and international standards.



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## 2. Mining Operations

### 2.1 Open-Pit Mines



- Haul roads, ramps, and pit slope stability inspections (geotechnical & structural monitoring)
- Shovel, dragline, drilling rig, and haul truck inspections (vibration analysis, oil analysis, thermography)
- Conveyor belt systems – pulley alignment, idler condition, belt wear & tear
- Dust suppression and water pumping systems integrity checks

### 2.2 Earthmoving & Hauling

- Mining Trucks (Rigid Haul Trucks, Articulated Trucks)



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- Excavators (Hydraulic, Electric)
- Shovels (Hydraulic, Electric Rope Shovels)
- Draglines
- Loaders (Wheel Loaders, Front-End Loaders)
- Bulldozers (Crawler, Wheel)
- Graders (Road Maintenance)
- Scrapers

## 2.3 Drilling & Blasting

- Rotary Drill Rigs
- Top-Hammer & Down-the-Hole (DTH) Drills
- Drill Rods & Bits
- Explosive Handling Equipment
- Blasting Machines & Initiators

## 2.4 Crushing & Screening

- Jaw Crushers
- Cone Crushers
- Gyratory Crushers
- Roll Crushers
- Impact Crushers
- Vibrating Screens
- Trommels & Screening Machines
- Feed Hoppers & Feeders

## 2.5 Material Handling & Conveyors

- Belt Conveyors (Primary, Secondary, Tertiary)
- Conveyor Idlers, Rollers, Pulleys
- Stackers & Reclaimers
- Bucket Elevators
- Transfer Chutes & Hoppers



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- Crushers Feeders

## 2.6 Utilities & Auxiliary

- Water Pumps & Dewatering Systems
- Dust Suppression Systems
- Compressed Air Systems
- Generators & Power Distribution Units
- Mobile Workshop & Maintenance Cranes

## 2.7 Underground Mines



- Shaft & hoisting systems (rope integrity, NDT, safety brakes, headgear inspections)
- Ventilation fans, ducts, and HVAC (airflow, dust, gas detection)
- Ground support systems (bolts, mesh, shotcrete, rock mass monitoring)



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- Electrical supply & switchgear – insulation resistance, partial discharge, grounding checks

## 2.8 Haulage & Loading

- LHDs (Load-Haul-Dump Machines)
- Underground Mining Trucks
- Scoops & Side-Discharge Loaders
- Shuttle Cars
- Underground Dumpers & Tippers

## 2.9 Drilling & Blasting

- Jumbo Drills (Multi-Drill Platforms)
- Raise Borers & Shaft Boring Machines
- DTH Hammers & Drill Rods
- Explosive Magazines & Loading Equipment

## 2.10 Ground Support & Rock Handling

- Roof Bolting Machines
- Shotcrete Sprayers
- Mesh & Rock Support Installation Equipment
- Ore Passes & Chutes
- Ore Skips & Hoists
- Underground Crushers (Gyratory, Jaw, Roll)

## 2.11 Conveyors & Material Transport

- Underground Belt Conveyors
- Belt Feeders & Take-up Units
- Chain Conveyors & Screw Conveyors
- Hoists & Winches for Ore Transport

## 2.12 Ventilation & Safety Systems



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- Ventilation Fans (Main & Auxiliary)
- Air Ducting & Dampers
- Gas Detection Sensors (CH<sub>4</sub>, CO, O<sub>2</sub>, SO<sub>2</sub>)
- Emergency Refuge Chambers
- Fire Suppression Systems & Sprinklers
- Escape Ladders & Emergency Exits

## 2.13 Pumps & Water Management

- Dewatering Pumps (Vertical, Submersible)
- Sump Pumps & Pipelines
- Water Storage Tanks & Piping
- Flow Monitoring & Pressure Sensors



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### 3. Crushing & Material Handling Systems

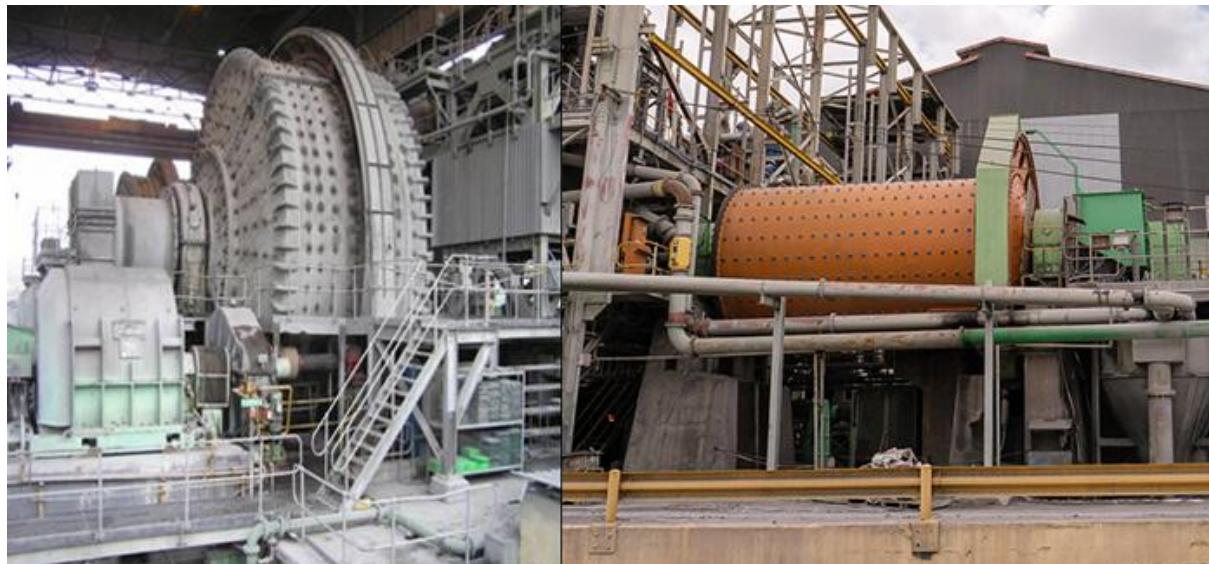


- Crushers (jaw, cone, gyratory) – vibration, wear liner thickness, oil quality
- Conveyor systems – belt splicing inspection, motor/gearbox vibration analysis, pulley NDT
- Screening units – bearing condition, motor temperature, structural weld inspection
- Stockpile reclaimers & stackers – mechanical & structural assessment



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## 4. Concentrator Plant (Milling & Flotation)



- SAG and Ball mills – shell integrity (UT scanning), girth gear & pinion inspection, lubrication oil analysis
- Flotation cells – tank integrity, agitator vibration analysis, motor thermography
- Cyclones & classifiers – wear condition, feed pressure monitoring
- Slurry pumps – vibration analysis, impeller erosion inspections



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## 4.1 Crushing & Concentration Plant Equipment's



- SAG Mills & Ball Mills
- Rod Mills & Pebble Crushers
- Cyclones & Hydro cyclones
- Flotation Cells & Agitators
- Thickener Tanks
- Slurry Pumps
- Magnetic Separators
- Filter Presses



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## 5. Smelter & Refinery (Copper & Cobalt)

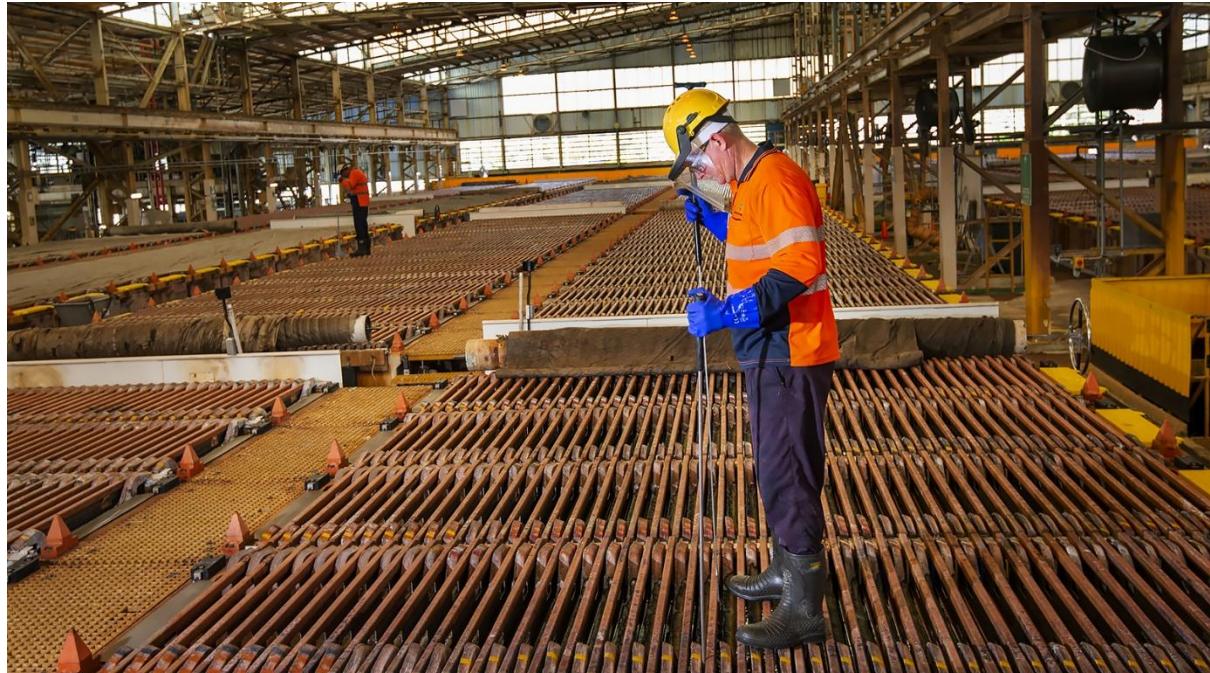


- Furnaces (reverberatory, electric arc, flash) – refractory lining thermography, shell thickness checks
- Anode casting wheel inspection – alignment, mechanical condition
- Electrolytic refinery cells – cathode plate inspections, corrosion assessment, rectifier & busbar integrity
- Gas cleaning systems – ESP/bag filters inspection, ductwork corrosion monitoring



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## 5.1. Smelter & Refinery Equipment's



- Electric Arc Furnaces
- Reverberatory & Flash Furnaces
- Gas Cleaning Plants (ESP, Bag Filters, Scrubbers)
- Anode Casting Wheels & Cooling Systems
- Electrolytic Refining Cells
- Cathode Handling Equipment
- Rectifiers, Transformers, Switchgear



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## 6. Acid Plant (500 TPD)



- Sulphur burners & converters – refractory integrity, shell temperature monitoring
- Heat exchangers – tube thickness (UT), fouling & corrosion inspections
- Acid storage tanks – NDT (UT, MFL), coating inspection
- Pumps, piping, and valves – vibration & leak testing
- Sulphur Burners & Converters
- Heat Exchangers
- Pumps, Piping & Valves
- Acid Storage Tanks
- Dust Collectors & Scrubbers



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## 7. Tailings Leach Plant (TLP)



- Leach tanks & agitators – structural integrity, coating inspections, NDT on welds
- Solution pipelines – thickness measurement, leak detection, corrosion mapping
- Pump stations – vibration analysis, thermography, oil analysis
- Tailings dam inspection – seepage monitoring, piezometer readings, slope stability
- Leach Tanks & Agitators
- Tailings Pipelines
- Pumps & Valves
- Tailings Dams & Containment Structures
- TLP Thickener



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## 8. Oxygen Plant



- Compressors & turbines – vibration analysis, lube oil analysis, balancing checks
- Cryogenic storage tanks – NDT (UT, radiography), insulation integrity
- Oxygen pipelines – leak testing, safety valve calibration
- Safety systems – fire suppression, alarm systems inspection
- Compressors & Turbines
- Cryogenic Storage Tanks
- Piping & Safety Valves
- Oxygen Distribution Lin



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## 9. Mechanical Department



- Rotating machinery condition monitoring (vibration, thermography, oil analysis)
- Welding & fabrication inspections – NDT (MPI, UT, RT) on repairs & new work
- Preventive & predictive maintenance programs implementation
- Lifting gear inspections – API RP 2D / LOLER compliance
- Rotating Machinery (Pumps, Fans, Gearboxes)
- Welding & Fabrication Equipment
- Lifting Gear (Cranes, Hoists, Slings, Shackles)
- Workshop Tools & Maintenance Equipment



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## 10. Electrical Department



- Transformers – DGA, thermography, insulation resistance
- Motors & generators – vibration, thermography, winding resistance testing
- Switchgear & MCCs – contact resistance, PD testing, breaker inspection
- UPS & emergency power systems – load bank testing, battery integrity
- Transformers & Switchgear
- Motors & Generators
- MCC & Control Panels
- UPS & Backup Systems
- Instrumentation & Automation Devices



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## 11. Automobile Engineering Department



- Heavy haul trucks, loaders, dozers – structural frame inspections, crack detection
- Hydraulic systems – hose condition, pressure testing, leak detection
- Diesel engines – oil analysis, emission monitoring
- Tyre inspections – wear, alignment, and safety compliance
- Heavy Mining Trucks & Loaders
- Dozers, Excavators, Graders
- Diesel Engines & Hydraulics
- Tyres & Brake Systems
- Maintenance Workshop Tools



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## 12. Methodologies & Tools Used

- **CBM Techniques:** Vibration analysis, thermography, oil analysis, ultrasound, electrical monitoring
- **NDT Techniques:** UT, RT, MPI, DPI, Eddy Current, MFL
- **Advanced Survey Tools:** Drone-based inspection, LiDAR mapping, geotechnical sensors, corrosion mapping
- **Digital Solutions:** IIoT-enabled monitoring, predictive analytics, and cloud-based reporting dashboards

## 13. Standards & Guidelines Followed

- **UK HSE Regulations & LOLER**
- **ISO 55000 – Asset Integrity Management**
- **API, ASME, ASTM, IEC, IEEE Standards**
- **ICMM (International Council on Mining & Metals) Guidelines**
- **OEM-specific inspection protocols**
- **Environmental & Safety Standards (OSHA, NFPA, IFC, ISO 14001)**

## 14. Deliverables

- Detailed inspection reports with photos, test results, and compliance status
- Fitness-for-service evaluations (FFS)
- Risk-based maintenance (RBM) recommendations
- Certification & compliance documentation (UK & international standards)
- Digital dashboards for real-time monitoring



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## 15. Conclusion

CBM 360 TIV provides **end-to-end technical verification and inspection** across the entire Copper & Cobalt mining value chain, ensuring:

- **Safe operations** (worker & environmental safety)
- **High reliability** (minimized downtime)
- **Regulatory compliance** (UK & global standards)
- **Extended asset life** (optimized maintenance & refurbishment planning)

Contact **CBM 360 TIV** today to learn how our **Mining & Metals Technical Verification Services** can support your project.

## 16. Services

- Services-

- Testing (**T**)
- Condition based Monitoring (**CBM**)
- Inspection (**I**)
- Auditing (**A**)
- Verification & Certification (**VC**)



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## 16.1 Testing (T)



**Visual Testing**



**Drone Inspection**



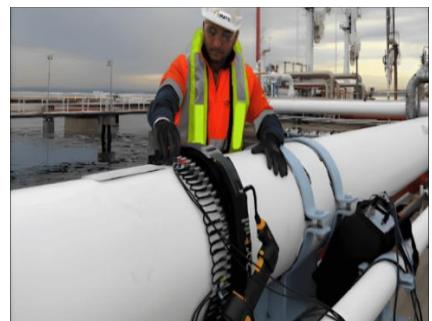
**Borescope Inspection**



**Ultrasonic Testing**



**Phased Array Ultrasonic Testing**



**Guided Wave Ultrasonic Testing & Long-Range Ultrasonic Testing**



**Liquid Penetrant Testing**



**Radiographic Testing**



**Magnetic Particle Testing & Fluorescent Magnetic Particle Testing**



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**Eddy Current Testing**



**Time of Flight Diffraction Testing**



**Hardness Testing**



**Lifting Gear Load Testing**



**Leak Testing**



**Positive Material Identification**



## Visual Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Detect surface defects and ensure structural integrity across Mining, Oil & Gas, FPSO/FSO, Industrial Manufacturing, and Power & Utility infrastructures.

Visual Testing (VT) is the most fundamental and widely applied Non-Destructive Testing (NDT) method, using the human eye (aided or unaided) to inspect for surface defects, misalignments, corrosion, cracks, and other discontinuities. CBM 360 TIV offers certified VT inspectors to ensure your assets meet quality, safety, and operational requirements at every stage of service life.

### Why Choose Visual Testing (VT) from CBM 360 TIV?



We can help you:

- Conduct cost-effective and immediate surface inspections without complex equipment
- Perform pre- and post-fabrication inspections for welds, components, and assemblies
- Detect early signs of cracks, wear, corrosion, deformation, and misalignment
- Identify surface finish issues, weld undercut, porosity, overlaps, and more
- Verify dimensional conformity and detect physical damage in critical areas
- Comply with international standards including ASNT, ISO, AWS, EN, API, ASME
- Support routine maintenance, shutdowns, fabrication, and commissioning stages
- Improve overall equipment reliability and reduce repair or rework costs



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Certified VT Inspection by Skilled Experts

CBM 360 TIV's certified Visual Testing professionals (ASNT, ISO 9712, PCN, CSWIP) utilize both direct (naked eye) and indirect (remote or magnified) techniques to ensure surface integrity and conformance. From handheld tools to remote visual inspection (RVI) with borescopes, mirrors, and cameras, we adapt to your asset's complexity and accessibility.

Our inspectors are trained to interpret visual indications accurately, ensuring immediate, reliable results and thorough documentation.

## Visual Testing Across Critical Industry Sectors

CBM 360 TIV provides VT inspection services for a broad range of sectors, including:

- ❖ Mining & Metal Plants – Hoists, crushers, structural steel, tanks
- ❖ Industrial Manufacturing & Processing – Pressure vessels, fabricated parts, machine frames
- ❖ Oil & Gas (Onshore & Offshore) – Pipelines, storage tanks, welds, pressure equipment
- ❖ FPSO & FSO Vessels – Hull welds, decks, cargo tanks, and structural frames
- ⚡ Power & Utilities (Hydro, Coal, Thermal, Gas, Geo Thermal) – Boilers, turbines, piping, condensers

## Our Visual Testing (VT) Services Include:

- Direct visual inspection (unaided)
- Indirect or Remote Visual Inspection (RVI): mirrors, endoscopes, cameras
- Inspection of welds, structural parts, pressure boundaries, and supports
- Surface condition assessment: cracks, corrosion, dents, leaks, pitting, and alignment
- Dimensional and geometrical verification
- Pre-weld, in-process, and post-weld visual examination
- High-resolution image capturing for documentation and reporting
- Visual condition monitoring during shutdowns, turnarounds, and maintenance

## Standards We Follow:

- ASNT SNT-TC-1A, ISO 9712, EN 13018, BS EN ISO 17637 – Personnel qualification and testing methodology
- AWS D1.1 – Structural welding code for steel visual inspection
- ASME BPVC Sec V Article 9 – Visual Examination
- API 510 / 570 / 653 – Pressure vessels, piping, and storage tank inspection
- ASTM E2031 – Standard practice for VT in industrial applications
- Project-specific QA/QC, EPC, or OEM requirements



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### Ready to Inspect with Precision?

Visual Testing is the first line of defines in structural and component integrity assurance. CBM 360 TIV brings trusted expertise, global experience, and certification-driven performance to your project — whether onshore, offshore, in fabrication shops, or on active industrial sites.

Contact CBM 360 TIV today to learn how our Visual Testing (VT) Services can enhance your quality assurance and asset reliability.

## Borescope Inspection



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Deliver precise internal visual inspections of critical components for Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Borescope inspection enables direct visual access to hard-to-reach internal areas such as pipes, turbines, engines, and pressure vessels without disassembly. CBM 360 TIV's Borescope Inspection Services help detect internal defects, corrosion, deposits, and wear — ensuring asset integrity and minimizing costly downtime.



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## Why Choose Borescope Inspection from CBM 360 TIV?



We can help you:

- Inspect internal surfaces of pipes, boilers, engines, turbines, and vessels where direct visual access is impossible
- Identify corrosion, cracking, deposits, erosion, and foreign objects inside components
- Support preventive maintenance and condition monitoring by detecting early-stage internal defects
- Reduce downtime and costs by avoiding unnecessary disassembly and enabling targeted repairs
- Provide high-resolution imagery and detailed inspection reports for accurate assessment and documentation
- Comply with industry standards and client specifications for internal inspections

## Trusted Borescope Inspection by Industry Experts

CBM 360 TIV deploys advanced video borescopes and fiberscopes operated by certified inspectors trained to assess internal component conditions accurately. Our services ensure comprehensive internal inspection and quality assurance — both on-site and offshore.

## Global Support Across All Industries

Our certified inspection teams bring vast experience across sectors, including:

- ❖ Mining and Metal Plants – Inspecting crushers, conveyors, slurry pipelines
- ❖ Industrial Manufacturing & Processing Plants – Reactors, pressure vessels, heat exchangers
- ❖ Oil & Gas Onshore/Offshore Facilities – Pipelines, risers, pressure vessels, compressors
- ❖ FPSO & FSO Vessels – Internal hull areas, ballast tanks, cargo tanks
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbine blades, boiler tubes, generator internals

## Our Borescope Inspection Services Include:



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- Visual inspection of internal welds, corrosion, cracks, deposits, and mechanical wear
- Remote visual inspection using flexible and rigid borescopes with lighting and video recording
- Condition assessment for turbines, engines, compressors, and pipes
- Verification of cleanliness and internal surface condition prior to maintenance or repair
- Detailed photographic and video documentation with expert reporting

### Standards We Follow:

- ASNT SNT-TC-1A – Personnel qualification and certification
- API 570, API 653, API 510 – Inspection of piping, tanks, and pressure vessels
- ISO 17637 – Visual testing including remote visual methods
- BS ISO 19232 – Industrial video borescope usage standards
- Project-specific OEM or EPC client inspection protocols



### Ready to Inspect Internal Assets?

Trust CBM 360 TIV's borescope inspection services to provide precise internal assessments that enhance asset reliability and safety while minimizing operational disruptions.

To learn how our Borescope Inspection Services can support your projects across mining, oil & gas, FPSO/FSO, and power sectors, contact CBM 360 TIV today.



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## Drone Inspection



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Enhance safety, access, and efficiency with aerial inspection solutions for Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Traditional inspection methods often involve scaffolding, rope access, confined space entry, or shutdowns. CBM 360 TIV's Drone Inspection Services (also known as UAV – Unmanned Aerial Vehicle inspections) offer a safe, fast, and cost-effective alternative for high-risk or hard-to-reach locations, delivering high-resolution imagery, real-time data, and actionable reports without interrupting operations.

### Why Choose Drone Inspection from CBM 360 TIV?



We can help you:

- Conduct visual inspections at height without putting personnel at risk
- Access confined, hazardous, or restricted areas safely and remotely
- Minimize downtime by eliminating the need for scaffolding or shutdowns
- Generate high-definition video and thermal imagery for asset condition evaluation
- Perform regular inspections for corrosion, cracks, leaks, and deformations
- Build 3D models and photogrammetry maps for precise analysis



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- Reduce inspection time and cost significantly
- Comply with site safety protocols and aerial regulations

## Trusted UAV Inspections by Certified Operators

CBM 360 TIV offers certified drone pilots and experienced inspection engineers trained in HSE compliance, asset integrity, and NDT/NDE requirements. Our UAV fleet is equipped with:

- HD/4K visual cameras
- Thermal infrared sensors
- Gas detection sensors
- LiDAR payloads
- Photogrammetry and 3D mapping systems

We tailor each drone inspection mission to your project requirements while ensuring zero personnel exposure to dangerous environments.

## Global Support Across All Industries

Our drone inspection capabilities are deployed across multiple industries, including:

- ❖ Mining and Metal Plants – Structural inspections of silos, towers, cranes, chimneys
- ❖ Industrial Manufacturing & Processing Plants – Tanks, stacks, pipelines, roof structures
- ❖ Oil & Gas Fields (Onshore & Offshore) – Flare tips, jackets, risers, pipelines, derricks
- ❖ FPSO & FSO Vessels – Hull surveys, deck structure inspection, mast towers
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Boilers, transmission lines, cooling towers

## Our Drone Inspection Services Include:

- Visual inspection (HD/4K imaging)
- Thermal imaging (hotspot detection, insulation failure)
- 3D modelling and orthophoto creation
- Roof and facade surveys
- Flare stack inspection (while operational)
- Internal tank/silo inspections using confined-space drones
- Emergency post-incident inspection (leaks, collapse)



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- Condition monitoring and asset life-cycle documentation

### Standards We Follow:

- ISO 21384-3 – Unmanned aircraft systems: Operational procedures
- CAA/FAA UAV Operational Regulations – Flight compliance and licensing
- ASME PCC-3, API 653, API RP 2D – Drone data applications in visual inspection
- ISO 16750 – Environmental conditions for drone equipment
- Site-specific HSE and asset integrity inspection protocols
- Inspection by trained NDT/NDE technicians and certified UAV pilots



**Ready to Reach New Heights?**

Let CBM 360 TIV's Drone Inspection Services revolutionize your asset inspection program by making it safer, faster, and smarter.

Contact us today to learn how aerial inspection can minimize downtime, reduce inspection costs, and deliver accurate data for critical decision-making — no matter where your facility is located.

## Phased Array Ultrasonic Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Advanced inspection technology for high-resolution detection of flaws in critical assets across Mining, Oil & Gas, FPSO/FSO, Industrial Plants, and Power & Utilities.

Phased Array Ultrasonic Testing (PAUT) is a sophisticated non-destructive testing (NDT) technique that uses multiple ultrasonic elements and electronic time delays to create detailed cross-sectional images of materials. CBM 360 TIV offers industry-leading PAUT services to



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detect weld defects, corrosion, cracks, and discontinuities with superior accuracy and repeatability — even in the most challenging environments.

### Why Choose PAUT Inspection from CBM 360 TIV?



We can help you:

- Detect and characterize internal flaws with high precision
- Replace conventional radiography with a safer, faster, and more accurate solution
- Ensure compliance with international standards such as ASME, ISO, and API
- Assess weld quality in new constructions or in-service components
- Minimize downtime with faster scanning and real-time imaging
- Improve inspection coverage and defect sizing accuracy
- Eliminate radiation hazards associated with RT
- Support complex geometries and difficult-to-access locations

### Key Features and Benefits of PAUT

- High-resolution imaging and real-time data acquisition
- Advanced flaw detection and accurate sizing (length, depth, height)
- Suitable for corrosion mapping and weld inspection
- Reduced inspection time compared to conventional UT or RT
- Immediate data interpretation and digital record keeping
- Minimal disruption to plant operations

Our certified PAUT specialists serve:

- ❖ Mining and Metal Plants – Welds in crusher frames, pressure piping, slurry lines
- ❖ Industrial Manufacturing – Piping spools, pressure vessels, structural components
- ❖ Oil & Gas Onshore/Offshore – Pipelines, risers, subsea welds, pressure systems



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🚢 FPSO & FSO Vessels – Storage tanks, flare towers, deck structures

⚡ Power & Utilities – Boilers, steam lines, turbines, heat exchangers

### Our PAUT Inspection Services Include:

- Weld inspection (butt, fillet, nozzle welds)
- Corrosion mapping of pressure systems and tanks
- Crack detection and flaw characterization
- TOFD integration for comprehensive weld evaluation
- Inspection of complex geometries and dissimilar metal joints
- Digital image analysis and permanent data storage

### Standards We Follow:

- ASME Section V – Ultrasonic Examination Articles 4 & 5
- ISO 13588 – PAUT of welds
- API 1104 / API 650 / API 653 – Pipeline and storage tank inspection
- EN ISO 9712 – Qualification and certification of PAUT personnel
- AWS D1.1 – Structural weld inspection
- DNVGL-CG-0051, ABS, Lloyd's Register – Marine and offshore codes

### Certified and Experienced Inspectors



Our inspectors are certified to PCN, ASNT, CSWIP, ISO 9712 Level II and III in PAUT, ensuring accurate interpretation and reporting. We utilize advanced portable phased array equipment from top manufacturers to guarantee data quality and inspection efficiency.

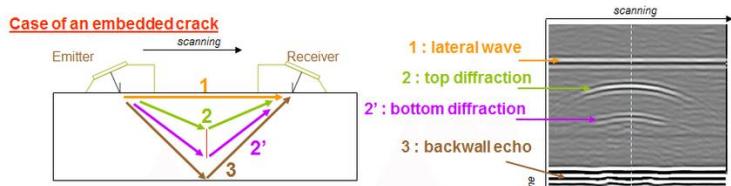
**Global Service. Local Expertise.**



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With CBM 360 TIV, you gain a reliable partner with a worldwide presence. Our PAUT services are deployed across:

- Onshore pipelines and terminals
- Offshore platforms and subsea assets
- Power plants and industrial processing units
- Storage tanks and ship hull structures



### Ready to Optimize Your Weld Inspection?

Let CBM 360 TIV's Phased Array Ultrasonic Testing (PAUT) services enhance your inspection quality, reduce risk, and support regulatory compliance — from fabrication to in-service maintenance.

Contact CBM 360 TIV today to schedule your PAUT inspection service.

## Time of Flight Diffraction Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – High-precision ultrasonic inspection to detect and size critical flaws in welds and materials across Oil & Gas Facilities, FPSO/FSO Vessels, Mining, Industrial Manufacturing, and Power Plants.

Time of Flight Diffraction (TOFD) is an advanced ultrasonic technique that provides accurate, reliable detection and sizing of flaws such as cracks, porosity, and lack of fusion in welds and materials. Unlike traditional UT, TOFD captures sound diffracted by the tips of flaws, delivering high-resolution imaging and precise through-thickness defect sizing.



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## Why Choose TOFD from CBM 360 TIV?



We can help you:

- Ensure the integrity of critical welds and components in high-pressure/high-temperature systems
- Obtain accurate defect sizing – critical for engineering assessments and repair decisions
- Cover large inspection areas quickly with fewer scan passes than conventional UT
- Reduce false calls and increase reliability of flaw detection
- Replace or supplement radiographic testing (RT) in many applications – no radiation risk
- Comply with international ASME, API, and ISO codes for weld inspections

## What Is TOFD?

TOFD uses a pair of ultrasonic probes (transmitter and receiver) positioned on opposite sides of a weld. When an ultrasonic pulse hits a defect, the wave diffracts at the flaw tip. These diffracted signals are detected by the receiver and recorded to create a detailed cross-sectional image (B-scan), revealing flaw size, shape, and position.

### ❖ Applications Across All Sectors

❖ Mining and Metal – Inspection of thick-section welds in pressure vessels, chutes, pipelines, and structural supports

❖ Industrial Manufacturing – QA/QC of fabrication welds in heavy process equipment and structural frames

❖ Oil & Gas Onshore/Offshore – High-accuracy weld inspections in pipelines, pressure vessels, separators, and risers

❖ FPSO & FSO Vessels – Inspection of hull welds, process piping, and storage tank welds with minimal operational disruption



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Inspection Integrity Innovation

Written by: Budagatla Satish

⚡ Power & Utilities – Turbine and boiler weld inspections in thermal, coal, gas, and nuclear power plants

### Our TOFD Inspection Scope Includes:

- Inspection planning and scan mapping
- TOFD data acquisition using dual probes and digitized scanning systems
- Real-time B-scan imaging and flaw characterization
- Detailed reporting with accurate defect sizing
- Integration with Phased Array Ultrasonic Testing (PAUT) for hybrid analysis (if required)

### Standards and Codes We Follow:

- ASME Section V, Article 4 & 23 (Appendix T) – Ultrasonic Examination
- API 1104 – Welding of Pipelines and Related Facilities
- ISO 10863 – Non-destructive testing of welds — TOFD technique
- ASTM E2373 – Standard Guide for TOFD examination
- EN ISO 9712 / SNT-TC-1A – Qualification and certification of NDT personnel

### Expert TOFD Services from a Global Leader

CBM 360 TIV offers you access to highly trained and certified TOFD inspectors backed by decades of experience. Our inspectors utilize state-of-the-art equipment and adhere to strict quality control protocols for accurate data and minimal downtime.

Whether it's a refinery turnaround, offshore shutdown, mining expansion, or thermal plant upgrade, our TOFD services ensure critical flaw detection with maximum reliability.



### Need High-Accuracy Weld Inspection?

To discover how Time of Flight Diffraction (TOFD) Inspection Services from CBM 360 TIV can safeguard your assets and meet international code compliance, contact us today.



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## Ultrasonic Testing (UT – Conventional)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure internal flaw detection and material integrity for Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Conventional Ultrasonic Testing (UT) is a core Non-Destructive Testing (NDT) technique used to detect internal flaws, measure material thickness, and ensure structural integrity in critical assets. Using high-frequency sound waves, UT provides precise, reliable, and repeatable inspection results.

CBM 360 TIV's UT services are widely trusted across industries to ensure compliance with safety codes, prevent failure, and reduce costly shutdowns.

### Why Choose Ultrasonic Testing from CBM 360 TIV?



We can help you:

- Detect internal flaws (cracks, inclusions, voids) and material discontinuities
- Measure wall thickness and corrosion wastage
- Perform lamination checks on rolled products and plates



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- Monitor weld quality and bond integrity in critical joints
- Provide real-time inspection and immediate results on-site
- Reduce risk of unexpected failure in mission-critical equipment
- Comply with international NDT codes and project-specific specifications

### Key Features and Benefits of Conventional UT:

- High Accuracy: Detects small internal flaws not visible to the naked eye
- Non-destructive: No damage to the asset or material
- Portability: Equipment is lightweight and field-ready
- Immediate Results: Flaws can be detected in real-time during inspection
- Depth Penetration: Capable of inspecting thick components and welds

### Industry Applications:

- ❖ Mining and Metal: Inspection of pressure pipes, gear housings, rollers, shafts, and crane hooks to ensure safety and prevent failure.
- ❖ Industrial Manufacturing and Processing: Used for checking castings, forgings, and structural welds during production or maintenance.
- ❖ Onshore/Offshore Oil & Gas and Chemical Facilities: Monitoring corrosion, weld integrity, and structural thickness of pipelines, pressure vessels, and risers.
- ❖ FPSO & FSO Vessels: Inspection of hull welds, storage tanks, deck structures, and internal supports for structural integrity.
- ❖ Power & Utilities (Hydro, Thermal, Coal, Geo Thermal, Gas): Inspection of turbines, boiler tubes, heat exchangers, and high-pressure piping for thickness loss or internal defects.

### UT Inspection Services Include:

- Weld inspection for internal discontinuities (slag, porosity, lack of fusion)
- Lamination and delamination checks in plates and rolled materials
- Thickness gauging to assess corrosion or erosion
- Flaw sizing and location mapping
- Acceptance criteria as per relevant code standards

### Standards We Follow:

- ASME Section V, Article 4 – Ultrasonic Examination Procedures
- ASTM E114, ASTM E164, ASTM E797 – UT aplicativos
- EN ISO 17640 – UT for welds
- ISO 16810 to ISO 16827 – General UT methods



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- API 570 / API 510 / API 653 – Piping and vessel inspection
- SNT-TC-1A, ISO 9712, PCN, CSWIP – Certification for UT personnel



**Ready to Detect What You Can't See?**

Let our certified UT inspectors provide accurate and reliable results to protect your operations.

Contact CBM 360 TIV today to schedule your Ultrasonic Testing inspection and ensure the safety and performance of your industrial assets.

## Guided Wave Ultrasonic Testing (GWUT) / Long Range Ultrasonic Testing (LRUT)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Detect corrosion and wall loss in inaccessible or insulated pipelines without removing coatings or digging.

Guided Wave Ultrasonic Testing (GWUT), also known as Long Range Ultrasonic Testing (LRUT), is a non-destructive testing (NDT) technique that uses low-frequency ultrasonic waves to inspect long stretches of pipe from a single location. It is ideal for detecting corrosion, metal loss, and other defects in pipelines that are above ground, buried, insulated, or hard to access.



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## Why Choose GWUT / LRUT from CBM 360 TIV?



We help you:

- Inspect pipelines without removing insulation or coatings
- Examine up to 100 meters (328 ft) in each direction from a single test point
- Detect localized corrosion, pitting, and wall thinning
- Prioritize sections for follow-up inspection (e.g., UT, RT)
- Identify hidden flaws in pipe supports, road crossings, and offshore risers
- Minimize downtime and inspection costs in plant and field conditions
- Improve predictive maintenance and reduce unplanned failures

## Key Features & Applications

- Non-intrusive: No need for surface stripping, excavation, or scaffolding
- Long-range capability: Covers long lengths of pipe in a single setup
- Effective screening: Helps identify and rank areas requiring further local NDT

## Global Experience in All Major Sectors

Our experienced GWUT teams work across:

- ❖ Mining & Metal Facilities – Slurry lines, tailings pipelines, remote conveyor piping
- ❖ Industrial Manufacturing & Process Plants – Steam lines, chemical delivery pipes
- ❖ Onshore/Offshore Oil & Gas Facilities – Insulated flowlines, risers, subsea tie-ins
- ❖ FPSO & FSO Vessels – Deck piping, cargo offloading lines, ballast systems
- ⚡ Power & Utility Plants – Condensate lines, superheated steam lines, buried pipelines



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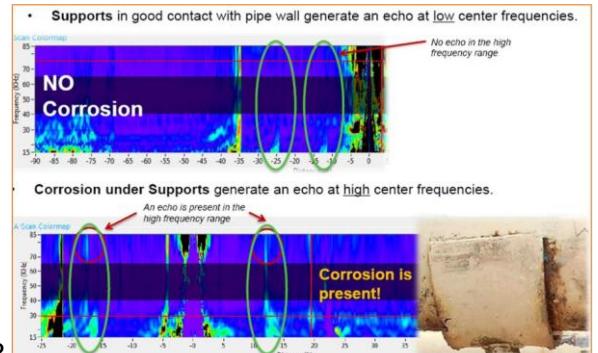
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### Our GWUT Services Include:

- Selection of test collars and rings for various pipe diameters
- Signal interpretation by qualified GWUT analysts
- Identification of potential corrosion anomalies or weld defects
- Reporting with location, amplitude, and severity classification
- Follow-up inspection recommendations for localized areas

### Standards We Follow:

- ASME B31.1 / B31.3 – Power & Process Piping
- API 570 – Piping Inspection Code
- ASTM E2775 / E2539 – Standard Practices for Guided Wave UT
- DNV-RP-F116 – Integrity management of submarine pipelines
- ISO/TS 12817 – NDT of pipelines using guided waves
- PCN / CSWIP / ASNT Level II/III Certified Technicians



### Ready to Inspect Long Runs of Pipeline without Excavation?

CBM 360 TIV's GWUT inspection team assess your inaccessible pipelines quickly, safely, and efficiently. Our expertise helps reduce downtime, lower costs, and support long-term asset integrity.

To learn how our Guided Wave Ultrasonic Testing (GWUT) can help protect your piping assets, contact CBM 360 TIV today.



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## Radiographic Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure internal defect detection and weld integrity across Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

During the fabrication, commissioning, and operational phases of industrial facilities, hidden flaws such as cracks, porosity, or inclusions within welds or castings can compromise safety and performance. CBM 360 TIV's Radiographic Testing (RT) service provides a non-destructive method to detect internal discontinuities, ensuring compliance, reliability, and asset longevity.

### Why Choose Radiographic Testing from CBM 360 TIV?



We can help you:

- Detect volumetric internal flaws (porosity, slag, inclusions, cracks) in welds and castings
- Ensure compliance with international fabrication codes and client specifications
- Provide permanent radiographic film or digital image records for documentation
- Perform inspection on in-service and new construction components
- Reduce rework and optimize weld quality control in the fabrication process
- Use both X-ray and gamma-ray sources (Ir-192, Co-60) based on site conditions
- Apply Digital Radiography (DR), Computed Radiography (CR), or Film Radiography as per project needs



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- Ensure safe execution with proper radiation safety protocols

## Trusted RT Services by Industry Experts

As a global leader in inspection, verification, and certification, CBM 360 TIV provides qualified RT personnel (ASNT, PCN, ISO 9712 certified) to carry out radiographic testing with full compliance to radiation safety and operational procedures.

Whether for construction weld inspections or routine in-service evaluations, our expert team ensures your assets meet the highest quality standards.

## Industry Coverage

Our Radiographic Testing services are applied across:

- ❖ Mining and Metal Plants – Weld joints in pressure lines, structural steel integrity
- ❖ Industrial Manufacturing & Processing – Cast components, pipe spools, heat exchangers
- ❖ Oil & Gas Fields – Pipelines, pressure vessels, risers, manifolds, storage tanks
- ❖ FPSO/FSO Vessels – Hull welds, cargo systems, flare towers, deck piping
- ❖ Power & Utilities – Boilers, turbine components, steam pipelines, condenser welds

## Our Radiographic Testing Services Include:

- Film Radiography (Conventional RT)
- Digital Radiography (DR) and Computed Radiography (CR)
- Gamma Radiography using Ir-192, Co-60
- Weld inspection for piping, tanks, pressure vessels, and structural elements
- In-service corrosion monitoring
- IQI (Image Quality Indicator) and sensitivity verification
- Digital image archiving and evaluation
- Full radiation safety compliance and barrier management

### Standards We Follow:

- ASME BPVC Section V – NDE Requirements
- ASTM E94 / E1030 / E1742 / E2445 –
- ISO 17636-1 & 2 – RT OF welds
- API 1104 / API 650 / API 653 – Piping and tank inspection
- EN 1435 / ISO 9712 / PCN / ASNT SNT-TC-1A – Certification and procedure control
- Radiation safety per IAEA, IRR17, or national regulations



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### Ready to Uncover What Lies Beneath?

Trust CBM 360 TIV's Radiographic Testing solutions to deliver safe, accurate, and standards-compliant inspections for your critical assets.

To discuss how our RT services can support your fabrication, maintenance, or commissioning needs, contact CBM 360 TIV today.

## Eddy Current Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure the integrity of conductive components with advanced Eddy Current Testing across Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power Utilities.

Eddy Current Testing (ET) is a highly sensitive electromagnetic NDT method used to detect surface and near-surface flaws in conductive materials. At CBM 360 TIV, we use this technology to inspect components without removing coatings or insulation, making it ideal for fast, cost-effective in-service inspection.

### Why Choose Eddy Current Testing from CBM 360 TIV?



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### We can help you:

- Detect cracks, corrosion, and pitting in metal components without the need for surface preparation
- Evaluate coating thickness and conductivity changes
- Perform rapid scanning of complex geometries, including bolt holes and welds
- Access difficult-to-reach areas without disassembly
- Minimize downtime with non-intrusive, high-speed inspection
- Ensure compliance with industry-specific standards and regulatory requirements
- Receive digital signal output and analysis for immediate evaluation and reporting

### Trusted Eddy Current Testing by Certified Experts

CBM 360 TIV provides Level II & III ET certified technicians with expertise in signal analysis, calibration, and real-time interpretation. Whether for routine asset management or shutdown inspections, our ET services deliver precision, speed, and confidence across sectors.

### Applications Across Key Industries

- 👉 Mining and Metal Plants Inspect structural beams, wire ropes, metal panels, and equipment like crushers and hoists for fatigue cracks and localized corrosion.
- 👉 Industrial Manufacturing & Processing Plants extensively to assess raw material integrity and in-process fabricated parts such as tubes, rods, and fasteners for inclusions, cracks, or laps.
- 👉 Oil & Gas Fields (Onshore/Offshore) and Chemical Facilities Examine piping systems, exchangers, and heat exchanger tubes for wall thinning, corrosion under insulation (CUI), or fatigue cracking without stripping coatings.
- 👉 FPSO & FSO Vessels Inspect hull welds, piping systems, and deck structures for stress corrosion cracking or pitting — including areas under non-conductive coatings.
- 👉 Power & Utilities (Hydro, Thermal, Coal, Geo Thermal, and Gas) Detect stress corrosion cracking, flow-accelerated corrosion (FAC), or micro cracks in turbine blades, generator windings, and boiler tubes.

### Key Features and Benefits

- High sensitivity to surface and near-surface defects in conductive materials

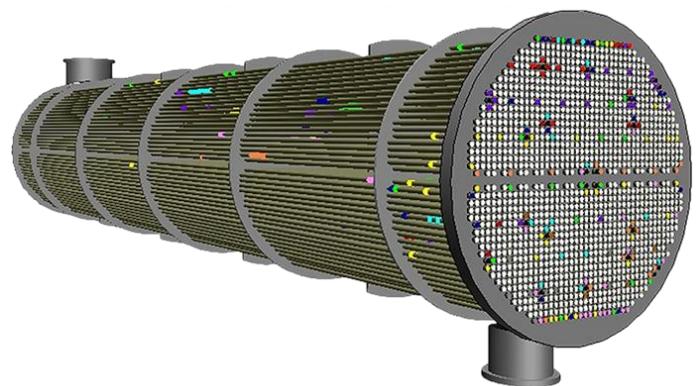


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- No need for complaint – dry method, no contamination risk
- Effective through coatings and thin insulation layers
- Portable and fast scanning, ideal for field inspections
- Data logging and real-time digital defect imaging
- Compatible with tube inspection probes, pencil probes, and array probes

### Standards We Follow

- ASTM E376 / ASTM E243 / ASTM E571 – Eddy current examination procedures
- ASME Section V, Article 8 – Eddy current method
- EN ISO 15548-1 / ISO 15549 – General principles for eddy current testing
- NADCAP / API / ASNT SNT-TC-1A / ISO 9712 / EN 4179 – Personnel qualifications and industry-specific compliance



### Ready to Detect Critical Flaws with Precision?

Let our expert Eddy Current Testing (ET/ECT) services ensure your components are free from critical defects – protecting life, assets, and compliance.

To discuss how our ET/ECT services can support your inspection strategy, contact CBM 360 TIV today.



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## Liquid Penetrant Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Surface crack detection and quality control for Mining, Oil & Gas, FPSO/FSO, Industrial, and Power Plant infrastructure.

During fabrication, commissioning, and maintenance phases, surface-breaking defects such as cracks, laps, seams, or porosity can compromise the safety and reliability of critical components. CBM 360 TIV's Liquid Penetrant Testing (PT / LPI) services deliver a fast, cost-effective method for detecting such flaws in both ferrous and non-ferrous materials — ensuring compliance and operational integrity.

### Why Choose PT Inspection from CBM 360 TIV?



We can help you:

- Detect surface-breaking flaws in welds, castings, forgings, and components
- Ensure weld quality and compliance with project or code-specific acceptance criteria
- Perform QA/QC verification for fabrication shops and field repairs
- Identify cracks, porosity, laps, seams, or fatigue cracks in non-magnetic materials
- Support shutdown maintenance, tank inspections, and offshore structures
- Comply with major industry standards and client-specific procedures
- Document defect findings, provide photographic evidence, and issue traceable inspection reports



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Global Presence, Certified Expertise

Our PT inspections are conducted by certified Level II & Level III inspectors qualified to international standards, ensuring consistent and reliable results across all industries. CBM 360 TIV's expertise spans:

### Principle of Operation

Liquid Penetrant Testing is based on the capillary action principle: a visible or fluorescent dye penetrant is applied to the clean surface of the test material. The dye seeps into surface-breaking defects. After a developer is applied, any penetrant trapped in the defects is drawn to the surface, forming visible indications that are then interpreted by certified inspectors.

PT is suitable for metals, ceramics, plastics, and glass – making it one of the most versatile surface inspection tools.

### Industry-Specific Applications

- ❖ Mining & Metal Industry: Detecting surface cracks in structural welds, hoisting equipment, mining tools, and crusher components.
- | 🏭 Industrial Manufacturing & Processing Plants: QA/QC of high-integrity welded joints, piping spools, tanks, and pressure parts.
- | 📜 Oil & Gas Fields (Onshore/Offshore): Inspection of pressure vessels, pipelines, risers, flanges, and safety-critical components.
- | 🛴 FPSO/FSO Vessels: Weld inspections in cargo tanks, deck areas, structural supports, and hull repairs.
- | ⚡ Power Utilities Plants (Hydro, Coal, Thermal, Gas, Geo Thermal): Evaluation of turbines, boiler welds, piping systems, valves, and high-temperature components.

### Our PT Inspection Services Include:

- Pre-cleaning of components
- Application of dye penetrant (visible or fluorescent)
- Dwell time monitoring based on material/defect type
- Excess penetrant removal (water-washable or solvent-based)
- Application of developer for indication bleed-out
- Visual examination under white or UV light
- Classification and recording of indications
- Defect mapping and photographic reporting

### Standards & Certification

- ASME BPVC Section V Article 6 – PT procedures and acceptance
- ASTM E165 / ASTM E1417 – Standard practices for PT
- ISO 3452 Series – Non-destructive testing — PT methods
- EN ISO 9712 / ASNT SNT-TC-1A / NAS 410 – Personnel qualification & certification
- API 510 / 570 / 653, AWS D1.1, project-specific specifications



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### Ready to Ensure Surface Integrity?

CBM 360 TIV offers rapid mobilization and full documentation for all Liquid Penetrant Testing activities worldwide. Contact us today to schedule your inspection campaign and secure the reliability of your critical components.

## Magnetic Particle Testing & Fluorescent Magnetic Particle Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Detect surface and near-surface defects in ferromagnetic materials to ensure the integrity of critical components in Mining, Oil & Gas, FPSO/FSO, Industrial, and Power sectors.

Magnetic Particle Testing is a powerful non-destructive method used to detect surface and slightly subsurface discontinuities such as cracks, laps, seams, and inclusions in ferromagnetic materials. Our MT/MPI and FMPT services deliver reliable defect detection, ensuring your assets remain safe and operational in the most demanding environments.

### Why Choose Magnetic Particle Testing from CBM 360 TIV?

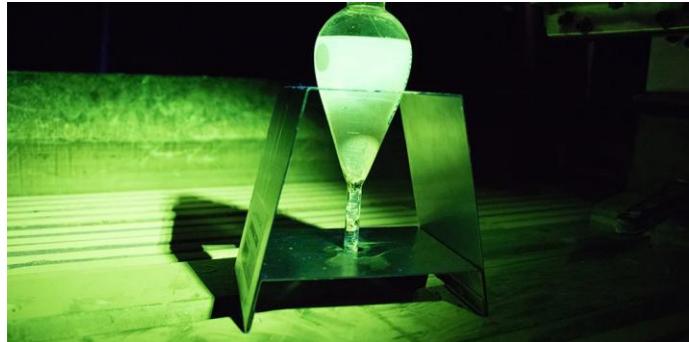


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We help you:

- Identify surface and near-surface defects in critical components like welds, forgings, castings, and rolled products
- Inspect a wide range of ferromagnetic materials common in mining equipment, pipelines, pressure vessels, and structural steel
- Use both visible (dry/wet black particles) and fluorescent (FMPT) methods to enhance defect visibility, especially in low-light or complex inspection areas
- Provide on-site or offshore testing, with rapid setup and immediate results to minimize downtime
- Comply with stringent industry standards and client-specific requirements
- Support preventive maintenance programs by detecting early-stage defects before failures occur
- Improve safety, reliability, and asset life across multiple industries

## Expert Magnetic Particle Inspection by Certified Professionals

At CBM 360 TIV, our team of certified Magnetic Particle Inspectors (MT/MPI) and Fluorescent MPI (FMPT) experts use advanced equipment and proven techniques to verify material integrity. Whether testing mining machinery, oil & gas pipelines, FPSO/FSO structural elements, or power plant components, we ensure your inspections meet the highest quality benchmarks.

## Global Experience Across Multiple Industries

Our inspection professionals bring deep expertise in:

- ❖ Mining and Metal Plants – Hoists, crushers, conveyor structures, metal castings
- ❖ Industrial Manufacturing & Processing Plants – Pressure vessels, piping, tanks, welds
- ❖ Oil & Gas Onshore/Offshore Facilities – Pipelines, risers, jackets, flare stacks
- ❖ FPSO & FSO Vessels – Hull structures, cargo tanks, ballast tanks, weld joints
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbines, boilers, generators, structural steel



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## Our Magnetic Particle Testing Services Include:

- Surface cleaning and preparation
- Magnetization techniques (AC, DC, Yoke, Prods) to induce magnetic field in test objects
- Application of magnetic particles – dry, wet, visible (black) or fluorescent (UV light)
- Detailed inspection for cracks, laps, porosity, and other surface/subsurface defects
- Demagnetization after testing to prevent residual magnetism
- Comprehensive inspection reports with defect characterization and recommendations

## Standards We Follow:

- ASTM E709 / ASTM E1444 – Standard practices for magnetic particle examination
- ASNT SNT-TC-1A – Personnel qualification and certification guidelines
- ISO 9934-1 / ISO 9934-2 – Magnetic particle testing procedures and equipment
- AWS D1.1 / API 1104 – Welding inspection standards incorporating MT/MPI
- EN ISO 17638 – NDT Magnetic Particle Testing
- Project-specific OEM, EPC, or client standards



## Ready to Detect Critical Defects Early?

Ensure the safety and reliability of your ferromagnetic assets with CBM 360 TIV's trusted Magnetic Particle Testing and Fluorescent MPI services.

Contact us today to discuss how we can support your inspection and maintenance programs across mining, oil & gas, FPSO/FSO, and power industries worldwide.



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## Hardness Testing Services



From CBM 360 TIV – Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure material strength, wear resistance, and heat-treatment quality for Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

The hardness of a material is one of the most critical indicators of its ability to resist wear, deformation, and failure under operational stresses. CBM 360 TIV's Hardness Testing Services deliver accurate and traceable measurements to verify that materials meet design specifications, quality requirements, and international standards — ensuring asset reliability in harsh industrial and marine environments.

Whether during new fabrication, post-weld heat treatment (PWHT) verification, in-service maintenance, or failure investigation, our hardness testing provides the confidence you need to keep operations running safely and efficiently.

### Why Choose Hardness Testing from CBM 360 TIV?



We can help you:

- Verify material hardness and strength to meet design and safety specifications
- Confirm heat-treatment quality and detect improper tempering or hardening
- Identify softening, embrittlement, or wear in critical service components
- Support failure analysis and root cause investigations
- Assess suitability for abrasion-, erosion-, or impact-prone applications
- Provide third-party QA/QC verification for EPC and OEM requirements
- Deliver on-site or laboratory-based hardness testing with quick turnaround
- Comply with international hardness testing standards for full certification



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## Trusted Hardness Testing by Industry Experts

CBM 360 TIV deploys certified inspectors and technicians with advanced portable and lab-based hardness testing equipment to meet your project's technical and logistical needs.

We offer a full range of hardness testing methods — Brinell (HB), Rockwell (HR), Vickers (HV), and Leeb (HL) — to suit material type, thickness, and application. Our team ensures accurate results through proper surface preparation, calibration, and environmental condition control.

## Global Support Across All Industries

Our hardness testing expertise covers:

- ❖ **Mining & Metal Plants – Crusher hammers, dragline pins, gear teeth, slurry pump impellers**
- ❖ **Industrial Manufacturing & Processing Plants – Forged shafts, pressure components, dies, and tooling**
- ❖ **Oil & Gas Onshore/Offshore Facilities – Wellhead housings, riser joints, subsea connectors, manifold blocks**
- ❖ **FPSO & FSO Vessels – Hull plating, crane hooks, winch drums, deck machinery**
- ❖ **Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbine rotors, valve seats, boiler tubes, generator shafts**

## Our Hardness Testing Services Include:

- Brinell Hardness Testing (HB) – Ideal for coarse-grained materials and large components
- Rockwell Hardness Testing (HR) – Fast and versatile for production control and finished parts
- Vickers Hardness Testing (HV) – High precision for thin sections, coatings, and microstructures
- Leeb Rebound Testing (HL) – Portable method for large, installed components
- Microhardness Testing – For surface coatings, thin films, and case-hardened layers
- Heat-Affected Zone (HAZ) Profiling – Hardness mapping across welded joints
- On-site field hardness testing with immediate reporting
- Complete documentation, calibration traceability, and QA/QC reporting

## Standards We Follow:

- ASTM E10 – Brinell hardness of metallic materials
- ASTM E18 – Rockwell hardness of metallic materials
- ASTM E384 – Micro indentation (Vickers & Knoop) hardness
- ASTM A370 – Mechanical testing of steel products



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- ISO 6506 / ISO 6507 / ISO 6508 – Brinell, Vickers, and Rockwell methods
- BS EN ISO 9015-1 – Hardness testing of welded joints
- ASME BPVC & API material verification requirements



### **Ready to Verify Your Material Integrity?**

Let our expert hardness testing team confirm that your materials meet the required strength, durability, and performance standards — from mining crushers to offshore risers and power turbines.

Contact CBM 360 TIV today to discuss how our Hardness Testing Services can strengthen your asset integrity management strategy.

## **Positive Material Identification**



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Assure material traceability, compliance, and reliability across Mining, Oil & Gas, FPSO/FSO, Power Plants, and Industrial Manufacturing sectors.

In high-risk industrial environments, the wrong material in critical components can result in catastrophic failures, unplanned shutdowns, and major safety incidents. CBM 360 TIV's Positive Material Identification (PMI) Inspection Services verify the chemical composition of metallic materials in real-time — ensuring full compliance with specifications, international codes, and material traceability requirements.



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## Why Choose PMI Services from CBM 360 TIV?



We help you:

- Prevent material mix-ups and verify correct alloy grade and chemistry
- Ensure material traceability and compliance with MTCs and project specs
- Identify unknown materials in legacy or undocumented systems
- Conduct in-situ testing without dismantling components
- Detect substitution of corrosion-resistant alloys or incorrect materials
- Mitigate risk of weld failures, pressure vessel breaches, and pipeline integrity loss
- Comply with QA/QC and third-party inspection protocols during fabrication, shutdowns, and commissioning
- Meet international requirements for API, ASME, ASTM, ISO, and NACE material verification

## Trusted PMI by Certified Experts

CBM 360 TIV provides trained and certified PMI operators equipped with state-of-the-art portable analysers (XRF and OES). Whether in fabrication yards, offshore platforms, power plants, or processing facilities, our team delivers fast, reliable results for:

- Incoming material inspection
- Welding and fabrication QA/QC
- Pressure equipment revalidation
- Maintenance shutdown material verification
- Root cause failure investigations

We ensure full documentation, reporting, and traceability for all PMI activities in line with project and regulatory requirements.

## Industry Applications Across All Sectors

- ❖ Mining and Metal Plants – Inspection of structural steels, wear plates, chute liners, slurry pipes
- ❖ Industrial Manufacturing – Raw material control, pressure parts, heat exchangers, forged items
- ❖ Oil & Gas Onshore/Offshore – Pipe spools, flanges, elbows, valves, pressure vessels, risers
- ❖ FPSO & FSO Vessels – Hull materials, deck components, stainless steel and CRA piping
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas) – Boilers, turbines, high-temperature piping systems



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### Our PMI Services Include:

- On-site chemical composition verification using XRF (X-Ray Fluorescence) and OES (Optical Emission Spectroscopy)
- Positive material identification for stainless steels, nickel alloys, chrome-moly steels, and exotics
- Detection of elements like Cr, Mo, Ni, Nb, V, Ti, Mn, Si, Cu, Fe, etc.
- Material mix-up prevention and traceability audits
- Spot checks, random sampling, and 100% population inspection
- Real-time digital reporting and full certification traceability

### Standards We Follow:

- API 578 – Material verification program for new and existing alloy piping systems
- ASME Section IX & VIII, ASTM E1476, ASTM E1086 / E415 / E1916 – PMI testing procedures
- ISO 17025, ISO 9001 – Quality control systems for inspection laboratories
- NACE MR0175 / ISO 15156 – Material compatibility in sour service
- Project-specific EPC specifications and QA/QC plans



### Ensure the Right Material, Every Time

CBM 360 TIV's PMI Inspection Services help eliminate material-related risks and ensure component reliability, especially in high-pressure and corrosive environments. Whether it's for fabrication verification, shutdown maintenance, or compliance audits, our inspection team is ready to support your operations — globally.

To ensure your assets are built and maintained with the correct certified materials, contact CBM 360 TIV today.



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## Leak Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure the safety, reliability, and pressure integrity of your critical systems across Mining, Oil & Gas, FPSO/FSO, Chemical Processing, Industrial Plants, and Power & Utility Infrastructure.

Leak testing plays a crucial role in maintaining asset integrity and operational safety. Whether during pre-commissioning, shutdown maintenance, or inspection intervals, CBM 360 TIV's Leak Testing Services are designed to detect even the smallest leaks in pipelines, pressure vessels, tanks, and valves — ensuring your systems meet compliance, safety, and performance standards.

### Why Choose Leak Testing from CBM 360 TIV?



We help you:

- Detect and localize leaks in pressurized and non-pressurized systems
- Ensure operational safety by preventing hazardous leaks of gas, air, steam, water, or chemicals
- Comply with regulatory standards (ASME, API, ISO, EN)
- Prevent unexpected downtime, energy loss, or environmental contamination
- Validate weld integrity, seal tightness, and gasket performance
- Perform pre-commissioning leak checks before startup
- Identify and troubleshoot aging or corroded piping systems



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- Provide third-party verification and certified test reports

## Trusted Leak Detection by Industry Experts

CBM 360 TIV deploys highly trained and certified inspectors utilizing advanced leak testing methods across various applications—both onshore and offshore.

We use techniques such as pressure decay, bubble testing, vacuum box testing, tracer gas methods (helium/hydrogen), ultrasonic leak detection, and mass spectrometry to ensure sensitive, accurate, and reliable results.

## Global Support Across All Industries

Our leak testing services support a wide spectrum of industries and infrastructure:

- ❖ Mining and Metal Plants – Leak detection in pipelines, slurry transport systems, and processing vessels
- ❖ Industrial Manufacturing & Processing Plants – Testing of heat exchangers, pressure vessels, gas cylinders, and process lines
- ❖ Onshore/Offshore Oil & Gas Facilities – Leak testing of risers, flare lines, pressure piping, valves, and separation units
- ❖ FPSO & FSO Vessels – Inspection of cargo tanks, ballast tanks, pipe racks, and onboard pressurized systems
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Boilers, steam lines, condensers, and water-cooled systems

## Our Leak Testing Techniques Include:

- Bubble Leak Testing – Low-pressure systems, flanged joints, and valves
- Vacuum Box Testing – Weld seams, tank floors, and liner systems
- Pressure Drop (Decay) Testing – Sealed vessels, piping, and air-tight enclosures
- Helium/Hydrogen Tracer Gas Testing – High-sensitivity leak detection in complex systems
- Ultrasonic Leak Detection – Non-invasive, fast method for compressed air/gas leaks
- Mass Spectrometer Testing – Ultra-fine leak detection in specialty and high-purity systems
- Hydrostatic / Pneumatic Testing – Proof testing for structural and pressure integrity

## Standards We Follow:

- ASME BPVC Section V, VIII, IX – Pressure testing and NDT standards
- API 650 / API 570 / API 510 – Storage tanks and piping inspection
- ISO 20485 / ISO 9712 – Leak testing and personnel certification
- EN 1593 / EN 13184 / EN 1779 – European leak detection methods
- ASTM E515 / E499 / E1002 / E1066 – Various leak detection techniques
- Certification per ASNT SNT-TC-1A, ISO 9712 – LT Level I/II/III



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### Ensure Leak-Free Operation Today

Trust CBM 360 TIV's qualified leak testing professionals to safeguard your assets from hazardous leaks and pressure failures. Our field-proven techniques and global expertise offer a reliable solution to protect your people, environment, and infrastructure.

To discuss how our Leak Testing Services can support your inspection, commissioning, or maintenance needs, contact CBM 360 TIV today.

## Lifting Gear Load Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure lifting equipment reliability, structural safety, and regulatory compliance across Mining, Oil & Gas, FPSO/FSO, Industrial Plants, and Power & Utility Projects.

Lifting operations are among the most safety-critical activities in heavy industries. Whether during construction, shutdowns, or routine operations, the failure of lifting gear can result in severe hazards, equipment damage, or operational downtime. CBM 360 TIV's Lifting Gear Load Testing & Certification Services ensure your equipment complies with international safety codes, performs reliably under load, and meets all statutory inspection requirements.

### Why Choose Load Testing from CBM 360 TIV?



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### We help you:

- Verify the safe working load (SWL) and structural integrity of all lifting equipment
- Perform on-site or offshore load tests using calibrated test weights or hydraulic systems
- Ensure compliance with legal, insurance, and client lifting regulations
- Detect fatigue, deformation, cracks, corrosion, or mechanical wear in lifting components
- Improve operational safety during lifting, rigging, hoisting, and critical lifts
- Issue Third-Party Load Test Certificates traceable to international standards
- Build confidence for statutory audits, plant commissioning, or asset resale
- Comply with international BS, ISO, LOLER, ASME, API, DNV, and LEEA standards

### Certified Testing Performed by Qualified Experts

CBM 360 TIV deploys LEEA-certified Inspectors, qualified engineers, and lifting specialists to assess your equipment, perform calibrated load testing, and issue full compliance reports.

Whether for routine inspections or commissioning of new installations, our testing procedures are backed by traceable calibration records, witness testing, and structural load analysis, ensuring peace of mind and incident-free lifting operations.

### Trusted Across Global Industries

Our lifting gear testing and certification services are delivered across:

- ❖ Mining and Metal Plants – Wire ropes, hoists, cranes, conveyor belt systems
- ❖ Industrial Manufacturing & Processing – Gantry cranes, chain blocks, lifting beams
- ❖ Oil & Gas (Onshore/Offshore) – Derrick cranes, rigging gear, pad eyes, sheaves
- ❖ FPSO & FSO Vessels – Lifeboat davits, cargo cranes, hatch covers, anchor winches
- ❖ Power & Utilities (Hydro, Coal, Gas, Thermal, Geo Thermal) – Turbine cranes, intake gate hoists, lifting tackles



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### Our Load Testing & Certification Scope Includes:

- Static Load Testing
- Dynamic Load Testing (under working conditions)
- Proof Load Testing (PLT)
- Visual Inspection of mechanical integrity and wear
- Magnetic Particle or Dye Penetrant NDT (as required)
- Functional testing of brakes, limit switches, hoisting chains
- Load cell measurements and deflection monitoring
- Issuance of Load Test Certificates, SWL markings, and compliance tags

### Standards & Regulations We Follow:

- LOLER 1998 (UK) – Lifting Operations and Lifting Equipment Regulations
- ASME B30.9 / B30.20 / B30.26 – Lifting slings, below-the-hook devices, rigging hardware
- BS EN 13155 / BS EN 1492 – Lifting equipment safety
- API RP 2D / DNV-ST-N001 – Offshore lifting gear inspection and testing
- ISO 9927-1 / ISO 4309 – Crane inspection and wire rope discard criteria
- LEEA, ASNT, DNV, ABS, BV recognized testing bodies



### Ready to Ensure Your Lifting Operations Are Safe and Compliant?

Let CBM 360 TIV's Load Testing & Certification Team support your operations by ensuring lifting devices, gear, and structures are safe, compliant, and ready for service.

Whether you operate in mining, oil & gas, FPSOs, or utilities, we are your trusted partner for third-party verification, audit readiness, and lifting equipment reliability.

Contact CBM 360 TIV today to discuss how our Lifting Gear Load Testing Services can support your safety, compliance, and operational uptime.



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## 16.2 Condition based Monitoring (CBM)



**Vibration Analysis & Balancing**

**Laser Shaft Alignment**

**Remote CBM via IoT Sensor & Cloud Monitoring**



**Infrared Thermography Testing**



**Lubrication & Transformer Oil Analysis**



## Vibration Analysis & Balancing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure machine reliability, reduce unplanned downtime, and improve safety in Mining & Metals, Oil & Gas, FPSO/FSO, Industrial Plants, and Power & Utility Facilities.

During the commissioning and operational phase of any rotating machinery, excessive vibration is one of the leading indicators of mechanical failure. CBM 360 TIV's Vibration Analysis and Balancing Services offer predictive diagnostics that help maintain machine health, avoid breakdowns, and extend equipment life.

### Why Choose Vibration Analysis & Balancing from CBM 360 TIV?



We can help you:

- Detect early-stage bearing wear, imbalance, misalignment, looseness, gear mesh issues
- Perform in-situ dynamic balancing on rotors, fans, blowers, and pumps
- Analyse vibration patterns using FFT, time waveform, and envelope analysis
- Conduct phase and orbit analysis for critical rotating assets
- Monitor asset health with baseline vibration trending
- Improve machine reliability, reduce maintenance costs, and optimize asset performance
- Ensure compliance with ISO 10816 / ISO 7919 machinery vibration standards • Support Condition-Based Maintenance (CBM) programs

### Trusted Condition Monitoring Experts



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CBM 360 TIV deploys ISO 18436-2 / BINDT Category I to III certified analysts with advanced portable vibration analysers, accelerometers, and balancing equipment to perform:

- Routine and troubleshooting vibration diagnostics
- Commissioning support for new equipment
- Acceptance testing during FAT/SAT
- Onsite balancing of rotating components to G1.0/G2.5 standards

## Industry-Wide Application

Our services are used across:

- 🔧 Mining and Metal Plants – Crushers, vibrating screens, gearboxes, pumps, mills
- 🏭 Industrial Processing Plants – Blowers, mixers, agitators, fans, turbines
- โรงแ� Onshore/Offshore Oil & Gas – Compressors, gas turbines, pumps, mud agitators
- 🚢 FPSO & FSO Vessels – Main engines, generators, shaft lines, HVAC blowers
- ⚡ Power Plants (Coal, Gas, Hydro, Geo-Thermal) – Turbo-generators, pumps, condensers

## Our Vibration Analysis & Balancing Services Include:

- Baseline vibration surveys
- FFT Spectrum Analysis
- Time Waveform and Envelope Analysis
- Phase Analysis & Orbit Plots (for sleeve bearing machines)
- Resonance Testing (bump test, coast-down test)
- Single and two-plane rotor balancing
- Condition monitoring route setup and data trending
- Root Cause Failure Analysis (RCFA)

## Standards We Follow:

- ISO 10816 / ISO 7919 – Vibration severity levels for rotating machinery
- ISO 21940-11 – Balancing standards
- ISO 18436-2 – Vibration analyst certification
- API 670 / API 618 / API 610 – Rotating equipment condition monitoring requirements
- OEM-specific vibration acceptance criteria



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### Ready to Optimize Your Machine Health?

Let our expert vibration analysts ensure your rotating assets run smoothly, safely, and efficiently — wherever your operations are.

To discuss how our Vibration Analysis and Balancing Services can help you reduce downtime and improve reliability, contact CBM 360 TIV today.

## Laser Alignment



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Precision alignment solutions for rotating equipment across Mining, Oil & Gas, FPSO/FSO, Industrial Processing, and Power Generation Facilities.

Proper shaft alignment is critical to achieving optimal machine performance and minimizing unplanned downtime. CBM 360 TIV's Laser Shaft Alignment Services utilize state-of-the-art laser systems to detect and correct angular, parallel, and axial misalignments with extreme precision, ensuring maximum efficiency, extended machine life, and reduced energy consumption.

### Why Choose Laser Alignment from CBM 360 TIV?



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**We can help you:**

- Prevent premature bearing, seal, and coupling failures caused by misalignment
- Reduce vibration and energy losses in rotating assets
- Enhance reliability and uptime of critical pumps, motors, turbines, compressors, gearboxes, and fans
- Improve production efficiency through precision alignment
- Minimize maintenance costs and MTTR (Mean Time to Repair)
- Receive detailed alignment reports for QA/QC and audit purposes
- Support plant commissioning, shutdowns, and retrofitting projects

## Where Laser Shaft Alignment Adds Value

Our laser alignment services are applicable across:

- ❖ Mining and Metal Plants – Crushers, slurry pumps, mills, conveyor drives
- ❖ Industrial Processing Plants – Blowers, agitators, mixers, and high-speed machines
- ❖ Oil & Gas Fields and Chemical Facilities – Pump trains, compressors, turbine generators
- ❖ FPSO & FSO Vessels – Rotating shafts, auxiliary systems, power generation modules
- ⚡ Power Plants (Thermal, Hydro, Coal, Gas, Geo-Thermal) – Steam and gas turbines, boiler feed pumps, cooling tower fans

## Our Laser Shaft Alignment Services Include:

- Horizontal and vertical shaft alignment (soft foot correction included)
- Thermal growth compensation techniques
- Coupling and base frame inspections
- Dynamic movement and real-time measurement
- Pre- and post-alignment reports with alignment condition summary
- Documentation for compliance and predictive maintenance strategies



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### Equipment We Use:

- Laser alignment tools from industry leaders like PRUFTECHNIK, Easy-Laser, ROTALIGN, Fixturlaser
- Dial indicator backup for verification if required
- Specialized fixtures for difficult or restricted-access applications

### Standards We Follow:

- ANSI/ASA S2.75-2017 / ISO 10816 – Mechanical vibration of rotating machinery
- ISO 1940-1, ISO 2852 – Balancing quality and mechanical tolerances
- API 610 / 617 / 618 / 686 – Rotating equipment requirements in oil & gas and chemical industries
- OEM specifications and project-specific engineering guidelines



### Ready to Optimize Your Rotating Equipment?

Let CBM 360 TIV provide precision laser shaft alignment services to improve machine reliability and reduce energy loss.

To discuss how our Laser Alignment Services can benefit your operations in mining, oil & gas, FPSO/FSO, and power sectors, contact CBM 360 TIV today.

## Remote CBM via IoT Sensor & Cloud Monitoring



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From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Unlock 24/7 asset insight, predictive failure alerts, and enhanced reliability through smart, sensor-based Condition-Based Monitoring for Mining, Oil & Gas, Industrial, and Power sectors.

As industrial operations become more complex and globally distributed, traditional manual inspections are no longer enough. CBM 360 TIV's Remote Condition-Based Monitoring (CBM) via IoT sensors and cloud platforms delivers real-time equipment health diagnostics, minimizing downtime, reducing maintenance costs, and enabling true predictive maintenance.

## Why Choose Remote CBM from CBM 360 TIV?



We can help you:

- Deploy wireless smart sensors on critical equipment like pumps, turbines, compressors, pipelines, motors, gearboxes
- Gain real-time performance data including vibration, temperature, pressure, humidity, flow, and energy consumption
- Access centralized cloud dashboards for remote diagnostics and multi-site monitoring
- Trigger predictive maintenance through AI/ML-based trend analysis
- Extend equipment lifespan and reduce OPEX
- Ensure round-the-clock asset visibility, even in remote, offshore, or hazardous environments
- Optimize maintenance cycles with condition-based triggers
- Improve compliance with safety and performance KPIs

## Smart Monitoring Backed by IoT & Data Science

CBM 360 TIV integrates cutting-edge Industrial IoT (IoT) technologies with cloud data analytics to transform raw equipment signals into actionable maintenance insights.

Our solutions include:

- Wireless vibration and temperature sensors
- Ultrasonic leak and steam trap monitoring
- Oil condition sensors (for viscosity, metal content, TAN)
- Smart gauges and energy meters
- Sensor gateways and secure cloud connectors



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All data is streamed to a cloud dashboard with user-configurable alarms, historical trend views, and predictive analytics powered by machine learning.

🔧 Applicable Across All Industries

Our smart CBM systems are trusted across:

⛏️ Mining & Metals – Conveyor systems, crushers, hoists, pumps

🏭 Industrial Processing Plants – Motors, fans, mixers, extruders, control valves

โรงแ� Oil & Gas (Onshore & Offshore) – Compressors, pipelines, pumps, separators, risers

🚢 FPSO / FSO Vessels – Rotating equipment, deck machinery, engine rooms

⚡ Power Plants (Thermal, Hydro, Geo, Gas, Coal) – Turbines, generators, boilers, condensers

### Standards & Protocols Followed:

- ISO 17359 – Condition Monitoring & Diagnostics of Machines
- ISO 13374 – Condition Monitoring Data Processing
- IEC 62591 – Wireless Communication for Industrial Monitoring
- OPC-UA, Modbus, MQTT, and REST API for seamless integration
- ISO 27001 / NIST for data security compliance

### Key Features of CBM 360 TIV's Remote CBM System:

- Plug-and-play sensor installation
- AI-based fault detection (bearing wear, imbalance, misalignment)
- Edge analytics and local alarming
- multi-equipment and multi-site monitoring
- Customizable cloud dashboards and mobile access
- Integration with CMMS / ERP systems
- Scheduled reports and health summaries



Get 24/7 Insight, Predict Failures Before They Happen



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CBM 360 TIV brings industry-leading expertise in predictive maintenance, machine diagnostics, and remote sensing to your operations.

Whether onshore or offshore, our Remote CBM Systems empower your team to move from reactive to proactive — and predictive — maintenance strategies.

To discuss how our IoT-based CBM services can reduce risk, extend asset life, and boost plant reliability, contact CBM 360 TIV today.

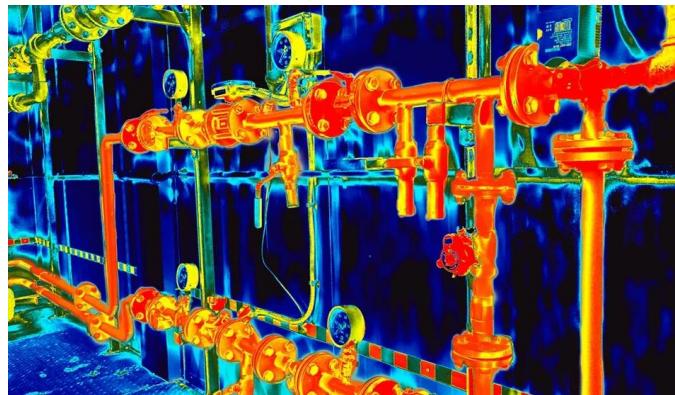
## Infrared Thermography Testing



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Early detection of thermal anomalies in Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Infrared Thermography (IRT) is a non-contact, non-destructive testing technique that uses infrared cameras to detect and visualize temperature variations on the surface of components. This powerful inspection method identifies abnormal heat patterns — often early indicators of equipment faults, insulation breakdown, or process inefficiencies — allowing for proactive maintenance and failure prevention.

### Why Choose Infrared Thermography from CBM 360 TIV?



We can help you:



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- Detect electrical hot spots in switchgears, transformers, MCCs, and bus bars
- Identify mechanical problems such as misalignment, bearing failure, or insufficient lubrication
- Locate insulation defects in piping, refractory-lined vessels, and HVAC systems
- Inspect solar panels, batteries, and electrical panels for overheating
- Prevent unplanned shutdowns and extend asset life
- Improve plant safety and operational reliability through early fault detection
- Comply with insurance and statutory safety requirements
- Enhance energy efficiency and reduce maintenance cost

## Trusted Thermographic Inspection by Certified Experts

CBM 360 TIV offers certified thermographers (ASNT Level I/II, ISO 18436-7) to perform detailed thermal inspections. Our advanced infrared camera systems combined with expert interpretation provide accurate diagnostics, ensuring optimal uptime and reliability of your assets.

Whether used as part of a predictive maintenance program or for troubleshooting, IRT allows maintenance teams to target exact areas of concern — before a failure occurs.

## Global Support Across All Industries

Our experienced IRT team serves clients in:

- ❖ Mining and Metal Plants – Motor controls, conveyor belts, crushers, lubrication systems
- ❖ Industrial Manufacturing & Processing Plants – Electrical panels, ovens, process heaters, compressed air leaks
- ❖ Oil & Gas Onshore/Offshore Facilities – Pressure relief valves, thermal insulation, pipeline tracing
- ❖ FPSO & FSO Vessels – Machinery spaces, process skids, heat exchangers, engine room panels
- ⚡ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Transformers, circuit breakers, cable trays, boiler refractory

## Our Infrared Thermography Services Include:

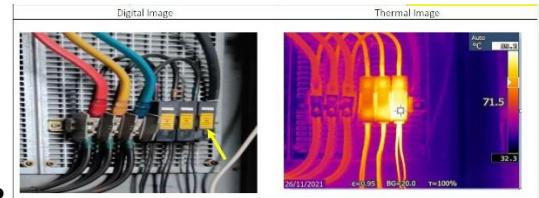
- Electrical thermographic inspection (live energized systems)
- Mechanical thermography (rotating & static equipment)
- Building envelope heat loss surveys
- Thermal imaging of insulation and refractory systems
- Solar PV panel heat mapping
- Pre-commissioning and routine thermography surveys
- Post-maintenance verification



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### Standards We Follow:

- ISO 18434-1 & ISO 18436-7 – Condition monitoring using thermal imaging
- ASNT SNT-TC-1A / CP-105 – Certification of thermography personnel
- NFPA 70B – Recommended practice for electrical equipment maintenance
- ASTM E1934 / ASTM E2582 / ASTM E1311 – Infrared inspections and thermal camera guidelines



### Ready to Detect Thermal Risks Before They Cause Failure?

Let our certified thermography team help you identify, diagnose, and mitigate critical thermal issues in your assets.

Contact CBM 360 TIV to schedule your Infrared Thermography Inspection and stay ahead of heat-related failures across industries.

## Lubrication & Transformer Oil Analysis



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure optimal machinery performance and extended asset life for Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Proper oil and lubrication condition is critical for preventing equipment failure and maximizing operational efficiency. CBM 360 TIV's Oil & Lubrication Analysis Services provide comprehensive testing and monitoring of lubricant health, contamination, and wear, ensuring you're rotating and electrical equipment operates reliably in the most demanding environments.



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Why Choose Oil & Lubrication and Transformer Oil Analysis from CBM 360 TIV?



We can help you:

- Monitor lubricant condition and contamination levels to optimize maintenance schedules
- Detect wear debris and particle contamination indicating internal component degradation
- Analyse viscosity, acid number (TAN), base number (TBN), and water content to ensure lubricant integrity
- Perform transformer oil testing to assess dielectric strength, moisture content, and dissolved gases for electrical asset health
- Prevent catastrophic failures and unplanned downtime by early detection of oil degradation
- Support condition-based maintenance (CBM) programs and reduce operational costs
- Comply with international standards and client-specific lubricant monitoring requirements

## Trusted Oil Analysis by Industry Experts

CBM 360 TIV operates state-of-the-art laboratories with certified technicians and experts in oil condition monitoring (OCM). Our detailed reports deliver actionable insights to maintenance and reliability teams, enabling informed decision-making to safeguard your critical assets.

## Global Support Across All Industries

Our oil and lubrication analysis services cover a wide spectrum of industries including:

- ❖ Mining and Metal Plants – Gearboxes, hydraulic systems, crushers, conveyors
- ❖ Industrial Manufacturing & Processing – Compressors, turbines, pumps
- ❖ Oil & Gas Onshore/Offshore Facilities – Drilling rigs, rotary equipment, turbines
- ❖ FPSO & FSO Vessels – Marine engines, thrusters, hydraulic systems
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Generators, transformers, turbine lubricants

## Our Oil & Lubrication and Transformer Oil Analysis Services Include:



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- Viscosity testing and oxidation stability
- Particle count and wear debris analysis using ferro graph
- Water content determination by Karl Fischer titration
- Total Acid Number (TAN) and Total Base Number (TBN) measurements
- Dielectric breakdown voltage and moisture content testing for transformer oils
- Dissolved Gas Analysis (DGA) for early fault detection in transformers
- Customized sampling and laboratory testing with rapid turnaround
- Detailed reporting and recommendations for lubricant change-out or equipment inspection

### **Standards We Follow:**

- ASTM D445, ASTM D4310, ASTM D974 – Oil viscosity, TAN, and TBN testing
- ISO 4406 / ISO 11171 – Particle contamination and cleanliness
- ASTM D3612 / IEC 60567 – Dissolved gas analysis (DGA)
- ASTM D1816 / IEC 60156 – Dielectric strength testing for transformer oils
- NACE TM 0386 – Water content in oil
- Project-specific OEM or EPC client standards and industry best practices



### **Ready to Maximize Equipment Reliability?**

Partner with CBM 360 TIV to leverage expert oil and lubrication analysis for your critical assets — reducing downtime, extending service intervals, and improving plant performance.

To discuss how our Oil & Lubrication and Transformer Oil Analysis Services can support your maintenance strategy, contact CBM 360 TIV today.



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### 16.3 Inspection (I)



**Third Party Inspection**



**Asset Integrity Inspection**



**Environmental Monitoring  
Inspection**



**Risk-Based Inspection**



**Welding Inspection**



**Electrical &  
Instrumentation  
Inspection**



**Painting Inspection**



**Gearbox Inspection**



**Health, Safety, and  
Environment Inspection  
HSE**



**Under Ground Mine Shaft Safety Inspection**



**Pre-Shipment Inspection**



**On-Site Laboratory & Sampling**

## Third Party Inspection (TPI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Assure quality, compliance, and impartial verification for your Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Projects, and Power & Utility Infrastructure.

In today's demanding industrial environment, ensuring the quality, safety, and compliance of equipment and processes is crucial — from procurement through commissioning. CBM 360 TIV's Third Party Inspection (TPI) Services provide independent, unbiased verification at every stage of your project, helping reduce risk, eliminate defects, and avoid costly rework.

### Why Choose Third Party Inspection from CBM 360 TIV?



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Inspection Integrity Innovation

Written by: Budagatla Satish



We can help you:

- Verify that equipment, materials, and components meet contractual and regulatory requirements
- Ensure supplier compliance with technical specifications, drawings, and international codes
- Prevent quality failures and project delays through independent quality oversight
- Provide objective inspection reports and certification documentation
- Ensure compliance with local and international regulations (ASME, ISO, API, etc.)
- Conduct inspections across manufacturing, fabrication, assembly, testing, and commissioning phases
- Improve stakeholder confidence with impartial, accredited inspection personnel

## Trusted Independent Inspections by Industry Experts

As a global leader in inspection, verification, and certification, CBM 360 TIV provides highly qualified and certified inspectors for mechanical, electrical, civil, instrumentation, and rotating equipment.

We act as your eyes and ears at vendor sites, construction yards, fabrication shops, or on project sites — ensuring transparency, compliance, and accountability throughout your supply chain.

## Global Coverage Across All Major Industries

Our Third-Party Inspection services are trusted by EPCs, OEMs, and end clients worldwide in:

- ❖ Mining & Metal Plants – Crushers, gearboxes, overhead cranes, structural steel
- ❖ Industrial Manufacturing & Processing Plants – Tanks, pressure vessels, skids, automation panels
- ❖ Oil & Gas (Onshore & Offshore) – Piping, valves, flare systems, separators, compressors
- ❖ FPSO & FSO Vessels – Turret systems, offloading arms, hull structures, tanks
- ⚡ Power & Utilities (Thermal, Hydro, Geo, Coal, Gas) – Turbines, switchgear, transformers, cooling systems



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### Our TPI Services Include:

- Review of technical documents (drawings, ITPs, QAPs, MTCs, etc.)
- Pre-shipment and post-manufacturing inspections
- Factory Acceptance Testing (FAT) and Site Acceptance Testing (SAT)
- Welding inspection, dimensional verification, NDT witnessing
- Pressure testing, coating, hydrostatic & pneumatic test witnessing
- Visual inspection, punch listing, and functional performance checks
- Expediting services and progress reporting
- Final documentation and release note (IRN, Inspection Release Certificate)

### Standards We Follow:

- ASME, API, ISO, DIN, EN, IEC, AWS, ASTM
- ISO 9001 / ISO 17020 – Quality and inspection body management systems
- IECEE CB Scheme, PED, ATEX, CE Marking
- Client-specific vendor quality specifications and ITPs
- Personnel qualified to SNT-TC-1A / ISO 9712 / PCN / CSWIP / BGAS / NACE



### Independent, Impartial, International

Whether for procurement validation, vendor surveillance, or site inspection, CBM 360 TIV ensures your project meets expectations — every time, everywhere.

To discuss how our Third-Party Inspection Services can add value to your global project, contact CBM 360 TIV today.



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## Asset Integrity Inspection (AII)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Safeguard operational reliability, regulatory compliance, and the lifecycle of your assets across Mining, Oil & Gas, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Sectors.

Asset failures can lead to catastrophic operational, environmental, and financial consequences. During all stages of your facility lifecycle — from design through to decommissioning — Asset Integrity Inspection Services from CBM 360 TIV ensure that your critical equipment and structures remain safe, compliant, and cost-effective throughout their service life.

### Why Choose Asset Integrity Inspection from CBM 360 TIV?



We can help you:

- Ensure asset integrity management systems (AIMS) align with international codes and client standards
- Identify and mitigate potential failure mechanisms (corrosion, fatigue, wear, erosion, etc.)
- Perform compliance inspections for pressure systems, piping, tanks, and structural components



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Inspection Integrity Innovation

Written by: Budagatla Satish

- Extend asset life through condition-based assessments and predictive maintenance support
- Reduce unplanned downtime, optimize maintenance schedules, and minimize risk of failure
- Support regulatory audits and insurance compliance
- Recommend fitness-for-service assessments and repair strategies
- Implement digital reporting tools and asset integrity databases for client-specific programs

## Trusted Integrity Management by Industry Experts

CBM 360 TIV offers a global network of highly trained inspectors, engineers, and certified integrity professionals (API, ASME, ISO, PCN, etc.). Our multi-disciplinary teams are capable of conducting onshore and offshore inspections across the most complex and critical infrastructure environments.

Whether you require routine surveillance, shutdown inspection, RBI (Risk-Based Inspection), or fitness-for-service evaluation — we provide assurance you can rely on.

## Global Expertise in Diverse Industries

Our asset integrity inspection specialists have extensive hands-on experience across:

- ❖ Mining and Metal Plants – Crushers, conveyors, pressure vessels, wire ropes, gearboxes
- ❖ Industrial Processing Plants – Reactors, pipe racks, heat exchangers, compressors
- ❖ Oil & Gas Onshore/Offshore Facilities – Pressure systems, risers, flare stacks, pipelines
- ❖ FPSO & FSO Vessels – Hull integrity, mooring systems, storage tanks, topsides
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbines, boilers, condensers, cooling systems

## Our Asset Integrity Inspection Services Include:

- In-service inspection (ISI) and turnaround/shutdown inspections
- API 510 / API 570 / API 653 certified pressure equipment inspections
- Corrosion mapping, UT thickness surveys, radiographic and advanced NDT (TOFD/Phased Array)
- Fitness-for-service evaluations as per API 579
- Risk-Based Inspection (RBI) implementation and review
- Piping and vessel classification per design standards
- Asset condition audits and life-extension strategies
- Structural and tank integrity assessments
- Drone and RVI for difficult-access structures
- Asset tagging, traceability, and digital reporting

## Standards We Follow:

- API 510 / 570 / 579 / 653 – Pressure vessels, piping, tanks, and fitness-for-service
- ASME Section V, VIII, B31.3 – Pressure components and piping codes
- ISO 55000 / ISO 17020 – Asset management systems and inspection body requirements



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Written by: Budagatla Satish

- DNV-RP-G101 / ABS Rules – Offshore structures and FPSO integrity
- NACE MR0175 / ISO 15156 – Corrosion control in oilfield systems
- Client-specific integrity frameworks and OEM guidelines



### Ready to Maximize Your Asset Performance?

Let CBM 360 TIV deliver industry-leading asset integrity inspections to ensure the safety, availability, and compliance of your facilities worldwide.

To discuss how our Asset Integrity Inspection Services can enhance lifecycle performance and reduce operational risk, contact CBM 360 TIV today.

## Environmental Monitoring Inspection (EMI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure regulatory compliance, minimize environmental impact, and maintain sustainable operations across Mining, Oil & Gas, FPSO/FSO, Industrial, and Power & Utility sectors.

In today's regulatory landscape, maintaining environmental integrity is not just a compliance requirement but a core responsibility. CBM 360 TIV's Environmental & Environmental Monitoring Inspection Services help you meet stringent environmental standards, avoid costly penalties, and ensure that your operations do not adversely impact surrounding ecosystems — from commissioning to decommissioning stages.



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## Why Choose Environmental Inspection from CBM 360 TIV?



We can help you:

- Achieve compliance with local, national, and international environmental laws
- Monitor air, water, soil, and noise pollution levels
- Ensure environmental management systems (EMS) meet ISO 14001 and project standards
- Identify potential environmental hazards and non-compliances
- Provide baseline environmental data collection during project commissioning
- Support EIA (Environmental Impact Assessments) and environmental permitting
- Detect and report leaks, spills, emissions, and waste discharge issues
- Improve sustainability and support green certification initiatives

## Trusted Environmental Inspection by Industry Experts

As a globally trusted inspection and certification company, CBM 360 TIV brings specialized knowledge and accredited environmental inspectors to help industries reduce environmental risk and support sustainable development goals (SDGs). Our team ensures that your project adheres to regulatory, ecological, and ESG performance criteria.

## Comprehensive Services Across All Industrial Sectors

Our environmental monitoring solutions are tailored to support:

- ❖ Mining and Metal Plants – Tailings monitoring, dust suppression, groundwater quality
- ❖ Industrial Manufacturing & Processing Plants – Stack emissions, hazardous waste audits
- ❖ Oil & Gas (Onshore/Offshore) – Produced water discharge, VOC monitoring, marine impact



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● FPSO & FSO Vessels – Ballast water management, SOx/NOx emission compliance

⚡ Power & Utilities (Hydro, Coal, Thermal, Gas, Geo Thermal) – Flue gas sampling, effluent treatment monitoring

## Our Environmental Inspection Services Include:

- Ambient air quality monitoring (PM10, PM2.5, SOx, NOx, CO)
- Stack emission monitoring (isokinetic sampling, CEMS verification)
- Water and wastewater sampling (pH, COD, BOD, TSS, heavy metals)
- Noise and vibration monitoring for workplace and boundary compliance
- Soil sampling and contamination assessment
- Waste management audits (hazardous/non-hazardous waste segregation and disposal)
- Greenhouse gas (GHG) reporting and verification
- Environmental audit and inspection reports for stakeholders and regulators

## Standards & Guidelines We Follow:

- ISO 14001:2015 – Environmental Management Systems
- EPA / CPCB / SPCB Guidelines – National regulatory compliance (India and global equivalents)
- IFC Performance Standards – Environmental and social risk assessment
- World Bank Environmental, Health & Safety (EHS) Guidelines
- MARPOL Annexes I-VI – Environmental compliance for marine vessels
- Local Environmental Regulatory Bodies (DOE, EPA, etc.)
- EIA/EMP Regulations – As per country-specific environmental clearance laws



## Ready to Ensure Sustainable & Compliant Operations?

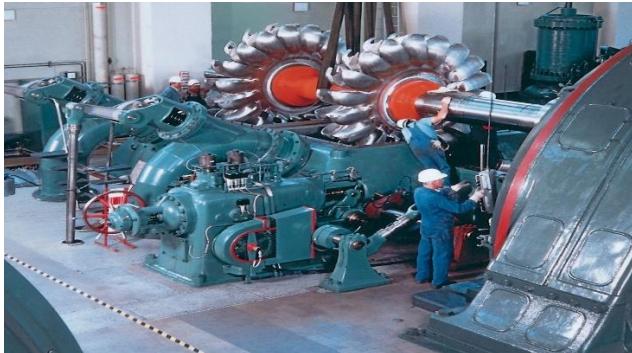
With CBM 360 TIV's Environmental Monitoring and Inspection services, your projects stay compliant, sustainable, and environmentally responsible — protecting both your business and the planet.

Contact us today to discuss how our tailored environmental inspection solutions can support your industrial operations and ensure compliance across every stage of your project lifecycle.



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## Risk-Based Inspection (RBI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Optimize inspection efforts and extend asset life by prioritizing risks in Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

In industries where equipment integrity is critical, Risk-Based Inspection (RBI) provides a strategic, data-driven approach to optimize inspection frequency and scope based on actual risk levels. CBM 360 TIV's RBI services help you reduce unplanned failures, extend inspection intervals, and focus resources on high-risk components — resulting in lower maintenance costs, better compliance, and safer operations.

### Why Choose Risk-Based Inspection from CBM 360 TIV?



We can help you:

- Identify high-risk equipment and prioritize inspection efforts accordingly
- Reduce overall inspection costs while improving plant reliability
- Extend inspection intervals and optimize shutdown planning
- Comply with regulatory and industry risk management frameworks
- Implement RBI within existing asset integrity management systems
- Enhance decision-making using quantitative and qualitative risk assessments



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Inspection Integrity Innovation

Written by: Budagatla Satish

- Integrate RBI with NDT, corrosion monitoring, and maintenance strategies
- Support asset life extension and safe operation in aggressive service environments

## Expert RBI Services from a Trusted Global Partner

As an industry leader in inspection and asset integrity, CBM 360 TIV offers certified RBI professionals, corrosion engineers, and inspection planners who work with advanced software tools and global best practices.

Our team develops and implements custom RBI programs tailored to your facility, asset types, and operating environments — ensuring you receive a complete picture of risk exposure and inspection priorities.

## RBI Expertise Across All Sectors

CBM 360 TIV brings experience in delivering RBI across critical assets in:

- ❖ Mining & Metal Plants – Tanks, pressure vessels, piping, rotary kilns
- ❖ Industrial Manufacturing Plants – Boilers, reactors, storage tanks, piping
- ❖ Oil & Gas (Onshore/Offshore) – Pressure systems, flare headers, heat exchangers, risers
- ❖ FPSO & FSO Vessels – Hull structures, cargo tanks, offloading systems
- ⚡ Power & Utilities (Hydro, Coal, Thermal, Gas, Geo Thermal) – HRSGs, condensers, steam piping, turbines

## Our Risk-Based Inspection Services Include:

- Asset criticality assessment
- Consequence and probability of failure analysis
- RBI data collection (material, corrosion rates, operating data)
- Risk ranking and inspection interval optimization
- Inspection plan development and review
- Integration with CMMS and Asset Integrity Management Systems
- Periodic RBI revalidation and update
- Support for Fitness-for-Service (FFS) and Life Extension Studies

## Standards We Follow:



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- API 580 / API 581 – Risk-Based Inspection methodology and quantitative assessment
- ASME PCC-3 – Inspection planning using RBI principles
- DNV-RP-G101 – Risk-based inspection of offshore topsides
- ISO 55000 – Asset management framework
- EEMUA 206 / NORSOZ Z-008 – Risk-based maintenance and inspection philosophies
- Client-specific integrity and risk standards



### Ready to Optimize Your Inspection Strategy?

Let CBM 360 TIV help you reduce inspection burdens, increase safety, and enhance asset performance with a proven Risk-Based Inspection approach.

To learn how our RBI Services can reduce cost and improve plant integrity, contact CBM 360 TIV today.

## Welding Inspection (WI)



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Inspection Integrity Innovation

Written by: Budagatla Satish

From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure structural integrity and code compliance across Mining, Oil & Gas, Power, FPSO/FSO, and Industrial Process Facilities.

Welding is a critical process that directly affects the structural integrity, reliability, and safety of components and systems. Whether during fabrication, shutdown, or field repair, CBM 360 TIV's Welding Inspection Services help verify that welds meet the highest quality standards and comply with international welding codes and client specifications.

## Why Choose Welding Inspection from CBM 360 TIV?

### We can help you:

- Verify weld joint quality and dimensional accuracy according to WPS (Welding Procedure Specification)
- Ensure compliance with relevant codes: ASME, AWS, ISO, API, DNV, etc.
- Monitor the full welding process: fit-up, welding parameters, consumables, preheat & post-weld treatments
- Identify welding defects using destructive and non-destructive testing methods
- Provide independent third-party verification of weld quality
- Qualify welders and procedures (WQT & PQR) as per industry standards
- Support documentation, traceability, and audit readiness
- Prevent costly rework or in-service failures

## Expert Welding Inspection by Certified Inspectors

CBM 360 TIV employs highly experienced and certified Welding Inspectors (CSWIP, AWS-CWI, BGAS, ISO 9712, PCN) who oversee and verify welding operations for critical infrastructure and equipment. Our inspectors operate both onshore and offshore, supporting clients through all project phases — from fabrication to installation to shut down.



## Industry Coverage Across Sectors

We provide welding inspection expertise across a wide range of industrial sectors:



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 Mining and Metal Plants – Welded tanks, crushers, pipelines, conveyor structures

 Industrial Manufacturing & Processing Plants – Pressure piping, structural steel, tanks

 Oil & Gas Onshore/Offshore Facilities – Flowlines, risers, pressure vessels, platforms

 FPSO & FSO Vessels – Hull structures, topside modules, flare towers, turret welds

 Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Boilers, turbines, condensers, steam lines

### Our Welding Inspection Services Include:

- Visual Welding Inspection (VT) – Fit-up, root pass, inter-pass & final inspection
- Welding Procedure Review – PQR, WPS, and WPQ validation
- Welder Qualification Testing (WQT) – Witnessing and verifying performance tests
- Non-Destructive Testing (NDT) – RT, UT, MPI, DPI for weld flaw detection
- Dimensional & Alignment Checks – Before, during, and after welding
- Preheat and Post Weld Heat Treatment (PWHT) verification
- Documentation Review – Welding logs, consumables traceability, material certificates
- Final Inspection and Quality Dossier Compilation

### Standards We Follow:

- ASME Section IX / B31.1 / B31.3 – Welding qualifications and piping codes
- AWS D1.1 / D1.6 – Structural steel and stainless-steel welding codes
- API 1104 / API 650 / API 653 – Welding for pipelines and storage tanks
- ISO 3834 / ISO 14731 – Quality requirements for welding
- DNV-OS-C401 / DNV-ST-N001 – Offshore welding and fabrication standards
- CSWIP 3.1 / 3.2, AWS-CWI, ISO 9712, BGAS, PCN – Inspector Certifications



**Ready to Ensure Weld Quality?**



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Inspection Integrity Innovation

Written by: Budagatla Satish

Trust CBM 360 TIV's expert welding inspection team to uphold the integrity of your welded structures and critical process equipment — ensuring compliance, durability, and safety in the most demanding environments.

To discuss how our Welding Inspection Services can enhance your project's success, contact CBM 360 TIV today.

## Mechanical Inspection (MI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure mechanical integrity, safety, and reliability across Mining & Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Units, and Power & Utility Infrastructure.

During the commissioning and operational phases of industrial facilities, mechanical components such as piping, pressure vessels, rotating equipment, and structural systems must undergo rigorous inspection to ensure safe and efficient operation. CBM 360 TIV's Mechanical Inspection Services deliver third-party assurance that your mechanical systems are installed, aligned, tested, and maintained in accordance with applicable codes and project specifications.

### Why Choose Mechanical Inspection from CBM 360 TIV?



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**We can help you:**

- Verify the design, fabrication, installation, and operational integrity of mechanical systems
- Inspect pressure vessels, piping systems, tanks, valves, and static/rotating machinery
- Perform witnessing and documentation of hydrotests, pneumatic tests, torquing, tensioning, and alignment
- Ensure compliance with ASME, API, ISO, and client specifications
- Detect material defects, misalignment, internal corrosion, or vibration anomalies
- Reduce operational risks, costly reworks, and premature equipment failure
- Provide on-site QA/QC verification, mechanical punch listing, and technical audits
- Support pre-commissioning, commissioning, turnaround, and shutdown phases

## Trusted Mechanical QA/QC by Experienced Inspectors

As a global leader in inspection and verification, CBM 360 TIV deploys certified mechanical inspectors and engineers with hands-on experience across a wide range of industrial environments. We ensure your mechanical systems are installed and functioning in full accordance with applicable codes, manufacturer guidelines, and project-specific requirements.

## Global Mechanical Support for All Industries

Our mechanical inspection teams serve critical industries including:

- Mining & Metal Plants – Crushers, hoists, pumps, wire ropes, gearboxes
- Industrial Manufacturing & Processing Plants – Heat exchangers, compressors, pressure vessels
- Oil & Gas Facilities (Onshore/Offshore) – Separators, flare systems, risers, pipeline networks
- FPSO & FSO Vessels – Cargo pumps, piping systems, structural welds, HVAC
- Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbines, condensers, pipe supports, valves



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Our Mechanical Inspection Services Include:

- Material identification and MTC review (traceability)
- Dimensional and alignment checks
- Welding inspection and NDT coordination
- Surface and internal corrosion assessment
- Hydrostatic and pneumatic pressure testing
- Valve inspection and torque/tension verification
- Bolted joint integrity and flange management
- Pre-commissioning checklists and mechanical completion documentation

## Standards We Follow:

- ASME Sec. VIII, IX, B31.1, B31.3 – Pressure vessels, power piping, and welding standards
- API 510, 570, 653 – Pressure vessel, piping, and tank inspection codes
- ISO 9001 / ISO 17020 – Quality management and inspection body standards
- AWS D1.1 / ISO 5817 – Welding inspection criteria
- Client-specific QA/QC procedures, construction specifications, and ITPs



## Ensure Mechanical Reliability with Confidence

Our mechanical inspection services are essential for ensuring long-term system reliability and regulatory compliance. Whether you're executing new construction, a major shutdown, or routine maintenance, trust CBM 360 TIV to deliver certified professionals and comprehensive inspection solutions.

Contact CBM 360 TIV today to discuss how our Mechanical Inspection Services can help safeguard the integrity and performance of your plant or facility.



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## Painting Inspection (PI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure long-term corrosion protection and coating integrity for Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

During the commissioning and operational phase of any industrial facility, the quality of protective coatings directly impacts asset life, safety, and operational cost. CBM 360 TIV's Painting Inspection Services ensure that your coating systems are applied correctly and in full compliance with international standards — reducing corrosion risk and ensuring asset integrity in the harshest environments.

### Why Choose Painting Inspection from CBM 360 TIV?



We can help you:

- Ensure all painting and coating systems meet project specifications and international standards
- Monitor surface preparation, environmental conditions, and coating application techniques
- Provide third-party QA/QC verification throughout the coating lifecycle
- Detect premature coating failures, surface contamination, or adhesion problems
- Improve corrosion protection, especially in aggressive offshore and marine environments
- Verify DFT (Dry Film Thickness), holiday testing, and adhesion as per client standards
- Protect your critical infrastructure and improve long-term maintenance planning



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Inspection Integrity Innovation

Written by: Budagatla Satish

- Comply with NACE, SSPC, ISO, and project-specific coating inspection criteria

## Trusted Coating Inspection by Industry Experts

As a world leader in inspection, verification, testing, and certification, CMB 360 TIV provides certified Coating Inspectors (NACE/Bgas/SSPC/ICore) to oversee and verify the quality of your painting and coating activities — on-site or offshore.

Our painting inspection professionals ensure that your surface preparation, application, curing, and final appearance meet the most rigorous quality control benchmarks.

## Global Support Across All Industries

Our global team of certified inspectors brings decades of experience in:

- ❖ Mining and Metal Plants – Structural steel, slurry tanks, and conveyor frames
- ❖ Industrial Manufacturing & Processing Plants – Structural piping, tanks, reactors
- ❖ Oil & Gas Onshore/Offshore Facilities – Risers, flare stacks, jackets, topsides
- ❖ FPSO & FSO Vessels – Hull external/internal, ballast tanks, cargo tanks, deck structures
- ⚡ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbine rooms, cooling towers, intake/outfall structures

## Our Painting Inspection Services Include:

- Surface cleanliness inspection (visual, soluble salt, dust checks)
- Environmental condition monitoring (humidity, dew point, substrate temp)
- Surface profile (anchor pattern) measurement
- Wet Film Thickness (WFT) and Dry Film Thickness (DFT) verification
- Adhesion testing (cross-cut, pull-off)
- Holiday (spark) testing for lining systems
- Visual appearance and colour matching
- Final documentation and coating report submission

## Standards We Follow:

- ISO 8501 / ISO 12944 – Corrosion protection of steel structures by coatings
- NACE SP0188 / NACE SP0178 – Coating inspections and qualifications



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- SSPC PA 2 / SSPC-SP1 to SP10 – Coating system preparation and DFT control
- BGAS-CSWIP, NACE Levels I/II/III, ICorr Levels I/II/III – Coating Inspector certifications
- Project-specific OEM or EPC client standards



**Ready to Protect Your Assets?**

Let our expert coating inspection team ensure the quality and durability of your protective systems across mining, oil & gas, FPSO/FSO, and power projects worldwide.

To discuss how our Painting Inspection Services can enhance your project performance, contact CBM 360 TIV today.

## Electrical & Instrumentation Inspection (E&I)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Assure safe, compliant, and performance-driven electrical and instrumentation systems for Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Manufacturing Units, and Power & Utility Plants.



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Inspection Integrity Innovation

Written by: Budagatla Satish

Electrical and instrumentation systems are critical to the safety, functionality, and efficiency of industrial facilities. CBM 360 TIV's E&I Inspection Services ensure that all installations, connections, control systems, and safety circuits are executed and maintained in accordance with international standards — reducing failure risk and increasing operational uptime.

## Why Choose E&I Inspection from CBM 360 TIV?



We can help you:

- Ensure your electrical and instrumentation systems meet engineering design, safety codes, and compliance requirements
- Verify installation and commissioning of power systems, control panels, field instruments, and cabling
- Perform loop checks, function testing, interlock verification, and calibration validation
- Detect wiring defects, grounding issues, or hazardous zone non-compliances
- Improve system reliability and safety, reducing potential downtime or electrical hazards
- Provide third-party QA/QC inspections, FAT, and SAT evaluations
- Verify ATEX, IECEx, and Ex equipment certifications for hazardous environments
- Comply with IEC, IEEE, NEC, API, and client-specific electrical codes and instrument standards

## Trusted E&I Inspection by Certified Professionals

As a global leader in testing, inspection, and verification, CBM 360 TIV provides certified E&I inspectors and engineers with proven expertise in electrical installations, instrumentation systems, hazardous area classifications, and control loop integrity — across industrial and offshore environments.

Our inspectors ensure full compliance with international electrical safety regulations, functional performance criteria, and instrumentation calibration accuracy.

## Global Support Across All Industries

Our E&I inspection professional's support:

❖ Mining & Metal Plants – MCCs, substations, motor controls, weigh feeders

❖ Industrial Manufacturing & Processing – PLCs, SCADA, RTUs, control loops



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Written by: Budagatla Satish

Oil & Gas Onshore/Offshore Facilities – Ex-rated panels, flow meters, level transmitters

FPSO & FSO Vessels – Power distribution, automation, shutdown systems

Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Generators, switchgear, protection relays

### Our E&I Inspection Services Include:

- Inspection of electrical panels, junction boxes, cable trays, and grounding systems
- Instrument calibration verification (pressure, temperature, level, flow)
- Loop checking and signal continuity testing (4–20mA, digital/analog signals)
- Function and interlock testing for shutdown and control systems
- Inspection of hazardous area Ex-rated installations (ATEX/IECEx)
- FAT (Factory Acceptance Test) and SAT (Site Acceptance Test) witness inspections
- IR thermography and insulation resistance (IR) testing
- As-built documentation, redlining, and punch list clearance

### Standards We Follow:

- IEC 60079 series – Electrical apparatus for explosive atmospheres (ATEX/IECEx)
- IEEE 1584 / IEEE 242 – Electrical arc flash and power system design
- NEC / NFPA 70 / API 500/505 – Electrical installations in hazardous locations
- ISA/IEC 61511 – Functional safety of safety instrumented systems (SIS)
- NETA ATS / ANSI / ISO/IEC 17020 – Acceptance and field-testing requirements
- Project-specific and EPC/OEM technical specifications



### Ensure Safe and Reliable E&I Systems

Let our certified Electrical & Instrumentation inspection team safeguard your systems and enhance compliance across critical assets in oil & gas, mining, power generation, and manufacturing sectors.

To discuss how E&I Inspection Services from CBM 360 TIV can strengthen your plant safety and performance, contact us today.



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## Gearbox Inspection (GI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure the mechanical health, performance, and reliability of gear-driven systems in Mining, Oil & Gas, FPSO/FSO, Industrial, and Power Generation facilities.

Gearboxes are critical components in heavy machinery across multiple industries, transmitting torque and motion to keep operations running smoothly. Over time, they are subjected to wear, misalignment, contamination, and fatigue. CBM 360 TIV's Gearbox Inspection Services provide comprehensive mechanical condition assessments using advanced techniques — reducing unplanned downtime, minimizing failure risks, and extending equipment life.

### Why Choose Gearbox Inspection from CBM 360 TIV?



We can help you:

- Identify early-stage mechanical faults such as gear wear, shaft misalignment, bearing degradation, or lubrication issues
- Conduct baseline, routine, or condition-based inspections to prevent catastrophic failure
- analysed vibration and oil data to detect potential gear mesh issues, backlash, or imbalance
- Provide third-party verification and reliability assessments for OEMs, operators, and EPCs
- Support root cause analysis of failed or underperforming gearboxes
- Reduce downtime, repair costs, and improve plant productivity
- Enhance maintenance planning and MRO inventory control



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Trusted Gearbox Inspection by Certified Experts

At CBM 360 TIV, our mechanical inspectors and reliability engineers are trained and certified in vibration analysis, tribology, thermal imaging, and borescope techniques, providing end-to-end gearbox condition assessments — on-site or offshore.

We follow global standards and best practices to detect hidden or developing faults inside gearboxes without dismantling them, minimizing production interruptions.

## Global Support Across All Industries

Our experts bring deep mechanical diagnostics experience across various heavy-duty applications:

- ❖ Mining and Mineral Processing Plants – Conveyor drives, crushers, hoists, and stacker gearboxes
- ❖ Industrial Plants & Refineries – Gearboxes in agitators, mixers, and rotary equipment
- ❖ Oil & Gas Production Facilities – Pumping stations, compressors, and top drive gear trains
- ❖ FPSO/FSO Vessels – Thruster units, turret mooring systems, winches
- ⚡ Power Plants (Coal, Hydro, Gas, Thermal) – Turbine drives, auxiliary gear trains, gear reducers

## Our Gearbox Inspection Services Include:

- Visual and structural inspection of casing, couplings, seals, and foundation
- Vibration analysis – identification of gear mesh frequency, imbalance, misalignment
- Borescope (video scope) – internal gear tooth inspection without disassembly
- Oil sampling and analysis – wear debris, viscosity, contamination, TAN/TBN
- Thermal imaging – detecting localized heating and lubrication issues
- Gear tooth pattern analysis – evaluate contact alignment and load sharing
- Ultrasound testing – detect lubrication starvation and bearing fatigue
- Shaft alignment checks – laser or dial gauge-based dynamic alignment

## Standards & Guidelines We Follow:

- ISO 10816 / ISO 20816 – Vibration evaluation for rotating machinery
- ISO 4406 / ASTM D7416 – Oil cleanliness and wear particle analysis
- AGMA 1010-F14 – Gear wear and failure assessment
- ASME B17.1, API 613/677, OEM-specific inspection requirements
- CBM practices from Vibration Institute, Mobius Institute, Noria
- Compliance with Root Cause Failure Analysis (RCFA) and Reliability Centered Maintenance (RCM) methodologies



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Inspection Integrity Innovation

Written by: Budagatla Satish



### Ready to Protect Your Gear-Driven Assets?

Let CBM 360 TIV deliver precise, data-driven gearbox inspection services to support your mechanical reliability goals. Our global team is equipped to serve industrial operations worldwide — onshore or offshore.

To discuss how our Gearbox Inspection Services can help reduce failure risk and extend asset life, contact CBM 360 TIV today.

## Health, Safety, and Environment Inspection HSE



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Safeguard health, ensure compliance, and minimize risks across Mining, Oil & Gas, FPSO/FSO, Industrial Manufacturing, and Power Plant Projects.

During the commissioning and operational phases of any project, maintaining the highest standards of health, safety, and environmental protection is not just a regulatory requirement — it's essential for sustainable operations, personnel wellbeing, and project success. CBM 360 TIV's HSE Inspection Services offer robust solutions to identify hazards, implement controls, and ensure compliance with international safety and environmental standards.



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Why Choose HSE Inspection from CBM 360 TIV?



We can help you:

- Evaluate technical and regulatory compliance
- Develop and implement HSE management systems
- Identify unsafe practices and prevent occupational incidents
- Monitor workplace hygiene, emergency readiness, and environmental controls
- Mitigate risks related to fire, explosion, hazardous materials, confined space entry, and more
- Comply with international HSE standards and project-specific requirements
- Improve operational safety culture and reduce downtime
- Deliver site-specific safety audits, reports, and improvement plans

## Trusted Safety & Environmental Compliance Experts

As a recognized leader in inspection and verification, CBM 360 TIV provides qualified HSE professionals, Safety Officers, and Environmental Auditors to ensure compliance with the latest health, safety, and environmental regulations – on-site or offshore.

Our experts work closely with your project team to maintain safety performance across entire lifecycles, from construction and commissioning to operations and decommissioning.

## Industry Coverage

We support clients across a range of industrial environments:

- ❖ Mining & Metal Processing Plants – Hazardous area assessments, dust and fume control, emergency response
- ❖ Industrial Manufacturing & Processing – Machinery guarding, lockout/tagout systems, waste disposal inspections
- ❖ Oil & Gas Facilities (Onshore & Offshore) – PPE compliance, work-at-height inspections, confined space safety
- ❖ FPSO & FSO Vessels – Helideck inspections, muster drills, tank entry procedures, fire system readiness



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Written by: Budagatla Satish

- ⚡ Power & Utilities (Hydro, Coal, Thermal, Gas, Geo Thermal) – Chemical storage, boiler room safety, electrical hazard audits

### Our HSE Inspection Services Include:

- Site safety audits and walkthrough inspections
- Hazard Identification and Risk Assessment (HIRA)
- Permit-to-Work (PTW) system audits
- Fire safety and emergency preparedness inspections
- Confined space and working at height compliance checks
- Environmental impact monitoring (air, water, noise)
- Waste management and pollution control inspection
- HSE training, toolbox talk facilitation, and safety documentation review

### Standards & Guidelines We Follow:

- OSHA, ILO, and ISO 45001 – Occupational health and safety management systems
- ISO 14001 – Environmental management systems
- NFPA – Fire protection standards
- API RP 75 / API 14C / IOGP standards – Oil & Gas safety and environmental compliance
- Local and project-specific HSE regulations



### Ready to Strengthen Your HSE Performance?

Let CBM 360 TIV ensure your project meets the highest safety and environmental standards. Our proactive HSE inspections reduce risk, improve workplace safety, and ensure full regulatory compliance.

To discuss how our HSE Inspection Services can support your operations, contact CBM 360 TIV today.



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## Underground Mine Shaft Safety Inspection



From CBM 360 TIV – Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure operational safety, structural stability, and regulatory compliance for underground mining shafts and hoisting systems.

Mine shafts are critical lifelines in underground mining operations, enabling safe transport of personnel, equipment, and ore. Any failure in shaft integrity, hoisting systems, or safety installations can lead to catastrophic downtime, injury, or loss of life.

CBM 360 TIV's Underground Mine Shaft Safety Inspection Services provide comprehensive, standards-compliant evaluations to ensure that shaft infrastructure, mechanical systems, and safety measures meet the highest operational and regulatory requirements. Our inspections reduce the risk of accidents, extend equipment life, and optimize maintenance planning.

### Why Choose Mine Shaft Safety Inspection from CBM 360 TIV?



We can help you:

- Verify structural integrity of shaft walls, headframes, guides, and stations
- Inspect hoisting systems, conveyances, and braking mechanisms for safety compliance
- Monitor wire ropes, sheaves, and winding drums for wear, corrosion, or fatigue
- Detect early signs of concrete deterioration, steel corrosion, or ground movement
- Validate performance of ventilation, lighting, and emergency escape systems
- Provide third-party safety audits for compliance with mining regulations and international standards



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Inspection Integrity Innovation

Written by: Budagatla Satish

- Identify and document hazards before they cause unplanned shutdowns or incidents
- Support maintenance planning with actionable inspection data

## Trusted Mine Safety Inspection by Industry Experts

CBM 360 TIV deploys mining safety specialists, mechanical inspectors, and structural engineers with decades of underground operational experience. We combine visual inspection, NDT methods, and mechanical performance testing to deliver a 360° safety assessment of your shaft systems.

Our inspection teams work in accordance with national mine safety codes and international best practice standards, ensuring reliable, independent, and audit-ready reports.

## Global Support for Mining Operations

We support shaft safety inspections in:

- ❖ Metal Ore Mines – Gold, copper, iron ore, platinum
- ↖ Coal Mines – Deep shaft and inclined drift operations
- ⌚ Industrial Mineral Mines – Salt, potash, gypsum
- 🏭 Processing & Smelting Plants linked to shaft systems

## Our Underground Mine Shaft Safety Inspection Services Include:

- Visual & structural integrity assessment of shaft lining, stations, and compartments
- Wire rope inspection & certification – magnetic flux leakage, diameter, lay, and lubrication checks
- Hoist system inspection – brakes, clutches, gearboxes, motors, control systems
- Guide & conveyance inspection – wear measurement, alignment, and fastening checks
- Sheave & drum NDT – crack detection, bearing checks, lubrication verification
- Emergency system checks – escape ladders, refuge bays, lighting, alarms
- Ventilation & environmental monitoring – airflow, gas detection, dust levels
- Complete inspection documentation and compliance reports for mining authorities

## Standards & Guidelines We Follow:

- ASME B30.7 – Base-mounted drum hoists
- ISO 4309 – Wire rope maintenance, inspection, and discard criteria
- MSHA CFR 30 Part 57 – Safety and health standards for underground mines



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Written by: Budagatla Satish

- CSA M424 – Underground mine shaft and hoist safety
- SANS 10295 – Shaft conveyance and hoist inspection
- OEM maintenance manuals and site-specific mine safety codes



### Ready to Secure Your Underground Operations?

Let our certified mine shaft inspection team safeguard your underground transport systems, improve reliability, and keep your operation compliant with the latest safety standards.

Contact CBM 360 TIV today to schedule your Underground Mine Shaft Safety Inspection and protect your people, assets, and production continuity.

## On-Site Laboratory & Sampling



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Rapid, reliable, and real-time quality assurance through mobile laboratory testing and sampling solutions for Mining, Oil & Gas, Industrial Plants, FPSO/FSO, and Power & Utility Infrastructure.

In high-risk industrial environments, timely and accurate material verification is critical to ensure safety, compliance, and operational continuity. CBM 360 TIV's On-Site Laboratory & Sampling Services deliver real-time data and rapid diagnostics directly at your project



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Written by: Budagatla Satish

location — reducing delays, improving quality control, and ensuring regulatory compliance during construction, commissioning, and operational phases.

## Why Choose On-Site Lab & Sampling from CBM 360 TIV?



We can help you:

- Perform rapid on-site testing and analysis for critical materials and fluids
- Minimize turnaround time by avoiding off-site lab delays
- Support project commissioning, troubleshooting, or failure investigation
- Enable real-time decision-making and on-the-spot adjustments
- Improve traceability and documentation for QA/QC compliance
- Maintain sampling integrity under strict chain-of-custody protocols
- Meet international laboratory testing standards across industries
- Reduce cost and risk of transporting hazardous or perishable samples

## Expert Mobile Lab Technicians & Field Analysts

Our on-site laboratories are staffed with trained, certified personnel — including chemists, metallurgists, NDT analysts, coating inspectors, and environmental technicians — capable of delivering reliable, standards-compliant lab testing directly at your facility.

Whether it's a remote mining operation or offshore platform, CBM 360 TIV's mobile lab units are fully equipped to operate independently or support your existing QA/QC framework.

## Our On-Site Lab Services Support:

❖ Mining & Metal Processing Plants – Ore grade testing, slurry & tailings analysis, soil contamination sampling



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- Industrial Manufacturing & EPC Projects – Construction materials testing (concrete, aggregates, coatings, weld consumables)
- Oil & Gas Onshore/Offshore Fields – Water cut, BS&W, viscosity, hydrocarbon sampling, corrosion testing
- FPSO & FSO Vessels – Fuel, lubricants, cooling water, cargo tank sampling, corrosion coupons
- ⚡ Power & Utilities (Hydro, Coal, Gas, Geo Thermal) – Boiler water quality, cooling tower chemistry, oil & transformer fluid testing

### Our On-Site Testing & Sampling Services Include:

- Water quality testing (pH, TDS, chlorides, iron, etc.)
- Fuel & lubricant oil condition analysis
- Paint/coating sampling & solvent rub testing
- Slurry, soil & sediment analysis (pH, heavy metals, moisture content)
- Concrete and aggregate sampling & field testing
- Weld consumable sampling and batch validation
- Corrosion coupon retrieval & pit depth measurements
- Air quality and dust particle sampling (PM10/PM2.5)
- Sampling protocols following ASTM, ISO, API, or local regulatory requirements

### Standards We Follow:

- ASTM, ISO, API, ASME, IEC – Sampling and lab analysis standards
- NACE TM0169 / TM0172 / SP0170 – Corrosion and materials testing
- EN 12457 / ISO 5667 / EPA 300 – Water, soil, and waste testing
- BS EN 206 / IS 456 – Field concrete testing and sampling
- Client-specific QCPs (Quality Control Plans), ITPs, and regulatory guidelines



### Ready for Rapid, On-Site Quality Assurance?

With CBM 360 TIV's On-Site Laboratory & Sampling Services, you get fast, flexible, and standards-compliant results — no matter how remote your project site. Let us help you maintain full material traceability and optimize your site's operational decisions.



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Contact CBM 360 TIV today to explore how our field lab and sampling teams can support your project success — from construction to operation.

## Pre-Shipment Inspection (PSI)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure product compliance, quality assurance, and supply chain integrity before shipment for global industrial procurement across Mining, Oil & Gas, FPSO/FSO, Power Plants, and Process Industries.

In today's global supply chains, the risk of receiving non-conforming, damaged, or substandard materials is high — especially for critical industrial equipment and components. CBM 360 TIV's Pre-Shipment Inspection (PSI) services help you verify product quality, quantity, marking, packaging, and compliance before dispatch from the supplier's site, ensuring that what you receive meets your project and contractual requirements.

## Why Choose Pre-Shipment Inspection from CBM 360 TIV?



We can help you:

- Ensure the conformity of goods to purchase orders, specifications, and technical drawings
- Prevent delivery of non-compliant, defective, or damaged equipment
- Verify product dimensions, workmanship, labelling, and certifications
- Confirm packing integrity, protection, and correct handling instructions



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- Reduce risk of delays, disputes, or rework at site
- Facilitate customs clearance, export/import compliance, and trade documentation
- Improve vendor accountability and enhance your quality assurance system
- Receive detailed pre-shipment inspection reports before dispatch
- Protect your project from costly shipment rejections or operational delays

### Our Pre-Shipment Inspection Services Include:

- Visual & dimensional inspection against drawings or POs
- Functional and operational testing (when applicable)
- Witnessing factory acceptance tests (FAT)
- Quantity verification and completeness check
- Packing and preservation check (IP rating, anti-corrosion, wooden crating, etc.)
- Container loading supervision (if requested)
- Marking & labelling compliance check (as per EPC or owner specs)
- Documentation verification (CoC, MSDS, ITP, welding records, traceability, etc.)
- Real-time reporting with photographic and video evidence

### Global Inspection Coverage Across All Supply Chains

Whether your materials are sourced from domestic vendors or overseas suppliers, CBM 360 TIV provides Pre-Shipment Inspection coverage worldwide — with local inspectors fluent in technical and regulatory requirements for:

### Standards and Guidelines We Follow:

- ISO 2859 – Sampling procedures for inspection by attributes
- IEC / ASME / API / ASTM / DIN – Product and manufacturing specifications
- Client-specific QCP/ITP and Purchase Specifications
- Incoterms 2020, export/import documentation and trade compliance
- International Packing Standards (ISPM-15, HPE, MIL-STD, etc.)

### Trusted by Global EPCs and OEMs

CBM 360 TIV's team of qualified QA/QC engineers and certified inspectors operate with full impartiality and transparency, providing you with confidence before goods are shipped — anywhere in the world. From individual component checks to complete system or skid package validation, we ensure your equipment is ready for delivery without compromise.



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### Ready to Secure Your Supply Chain?

Minimize procurement risk and gain full confidence in your shipments. Trust CBM 360 TIV's Pre-Shipment Inspection services to verify, validate, and protect your investment.

To learn more or schedule an inspection, contact CBM 360 TIV today.



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## 16.4 Auditing (A)



### Technical Audit

### Operational Audit

### HSE Health, Safety, and Environment Audit



### Fire and Safety Audit

### Asset Integrity Management Audit

### Production Import/Export Audit



### Financial Audit



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## Technical Audit (TA)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Identify non-conformities, improve compliance, and drive operational excellence across Mining, Oil & Gas, FPSO/FSO, Industrial, and Power Generation sectors.

In today's competitive and safety-conscious environment, ensuring that your operations, equipment, procedures, and personnel adhere to technical and regulatory requirements is critical. CBM 360 TIV's Technical Audit Services offer a comprehensive evaluation of your systems, facilities, and documentation — helping you minimize risk, enhance efficiency, and maintain compliance with international standards and client-specific specifications.

### Why Choose Technical Audit from CBM 360 TIV?



We can help you:

- Identify non-compliance, design flaws, and operational risks across the project lifecycle
- Verify conformity with project specifications, industry codes, and international standards
- Evaluate equipment performance, maintenance practices, and condition-based reliability
- Assess the quality of work, procedural adherence, and documentation integrity
- Detect latent issues that could affect safety, uptime, or production efficiency
- Support root cause analysis and suggest corrective/preventive action (CAPA)
- Provide third-party independent verification and technical due diligence
- Assist in project close-out or transition to operation (commissioning support)



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## Trusted Technical Audits by Industry Specialists

Our certified and experienced technical auditors bring domain expertise across mechanical, electrical, instrumentation, and process disciplines. CBM 360 TIV offers both pre-audit assessments and compliance audits, tailored to your operational phase—whether in engineering, construction, commissioning, or plant operation.

Our independent, objective audits help your organization uphold quality, reduce failure rates, and continuously improve.

## Global Support Across All Industrial Sectors

We provide technical audits for:

- ❖ Mining & Metals – Conveyors, crushers, smelters, process plants
- ❖ Industrial Manufacturing & Processing – Fabrication units, machinery, quality systems
- ❖ Oil & Gas (Onshore/Offshore) – Process systems, pipelines, compressors, instrumentation
- ❖ FPSO & FSO Vessels – Process modules, turret systems, ESD/fire & gas systems
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Turbines, control systems, auxiliary units

## Our Technical Audit Services Include:

- System and process audit (mechanical, electrical, instrumentation)
- Asset integrity and performance review
- Preventive maintenance system effectiveness audit
- Document verification (drawings, P&IDs, QA/QC records)
- Statutory and regulatory compliance audit
- Root Cause Analysis (RCA) and Risk-Based Inspection ( RBI) input
- Engineering design and vendor document conformity audit
- Third-party verification for handover and commissioning

## Standards We Follow:

- ISO 9001 / ISO 14001 / ISO 45001 – Quality, Environmental, and Occupational Health & Safety Management
- API Q1/Q2, ASME, IEC, NFPA, and OEM Standards
- Project-specific EPC/Owner technical specifications
- OSHA, NFPA, and local regulatory guidelines



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- Industry best practices for risk, reliability, and integrity management



### Ready to Improve Your Operational Integrity?

With CBM 360 TIV as your auditing partner, you gain a reliable and experienced team that works across industry verticals to deliver actionable insights and support continuous improvement.

To explore how our Technical Audit Services can support compliance, performance, and safety for your project or plant, contact CBM 360 TIV today.

## Operational Audit (OA)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Optimize safety, compliance, efficiency, and asset performance for Mining & Metal Plants, Oil & Gas Operations, FPSO/FSO Vessels, Industrial Facilities, and Power & Utility Infrastructure.

Operational efficiency and safety are critical for sustainable performance across heavy industries. CBM 360 TIV's Operational Audit Services provide a structured, objective assessment of your plant's operational activities, systems, and controls to identify risks, ensure compliance, and drive continuous improvement.



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## Why Choose Operational Audit from CBM 360 TIV?



We can help you:

- Evaluate your plant's operational performance, control systems, and compliance status
- Detect inefficiencies, bottlenecks, or process deviations before they escalate
- Benchmark your operations against industry best practices and regulatory requirements
- Ensure conformance with HSE, quality, production, and maintenance objectives
- Identify safety-critical gaps that could lead to equipment failure or downtime
- Review procedures for logistics, materials handling, personnel safety, and emergency response
- Optimize energy usage, utilities management, and cost-effective resource allocation
- Provide an independent, third-party verification to improve stakeholder confidence

## Expert Operational Review by Industry Specialists

CBM 360 TIV combines deep domain knowledge with hands-on field experience to deliver customized operational audits tailored to your facility type, operating environment, and regulatory requirements.

Our operational auditors include certified engineers, HSE professionals, and reliability specialists capable of auditing diverse assets — from upstream oil rigs to power turbines and mineral processing units.

## Global Auditing Expertise Across All Sectors

We serve a broad range of industries with field-proven auditing protocols:

- ❖ Mining & Metal Plants – Ore handling, mineral separation, process optimization
- ❖ Industrial Manufacturing & Processing Plants – Production efficiency, logistics, utilities
- ❖ Oil & Gas (Onshore/Offshore) – Drilling operations, hydrocarbon processing, ESD systems



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🚢 FPSO/FSO Vessels – Marine operations, turret systems, cargo handling, safety management

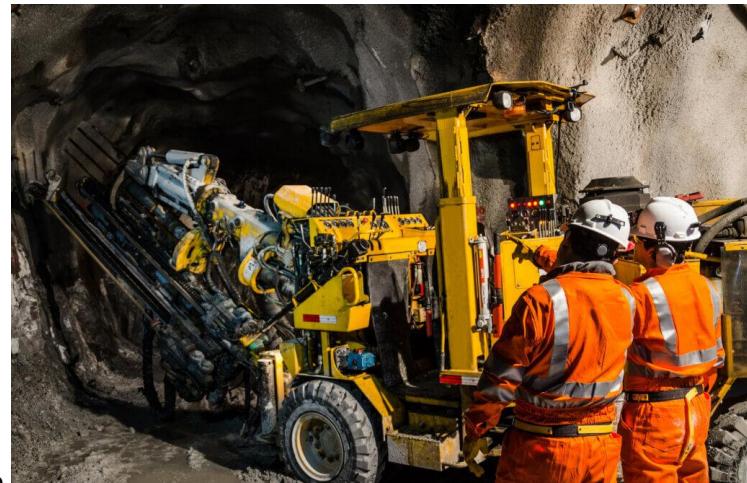
⚡ Power & Utility Plants (Hydro, Thermal, Geo Thermal, Coal, Gas) – Generation, water treatment, emissions monitoring

### Our Operational Audit Scope Includes:

- Review of SOPs, maintenance logs, and operational data
- Inspection of critical systems and rotating/static equipment performance
- Safety system functionality (alarms, interlocks, fire/gas detection, ESD)
- Personnel competency assessment and workflow review
- Emergency response preparedness and drills validation
- Energy usage, utilities and environmental compliance checks
- Risk identification (HIRA), gap analysis, and audit reporting
- Corrective action recommendations and performance dashboards

### Standards & Guidelines We Align With:

- ISO 55000 – Asset Management
- ISO 9001 / 14001 / 45001 – Quality, Environmental & Occupational Health and Safety Management
- API RP 754 / 580 / 581 – Operational Risk & Process Safety
- NFPA, OSHA, IEC/ISO Functional Safety – Safety and system integrity
- Client-specific standards, OEM/EPC procedures, and regulatory frameworks



Maximize Uptime & Compliance

Ensure your operations run efficiently, safely, and in full compliance with industry standards. CBM 360 TIV's Operational Audit Services provide actionable insights to strengthen your plant's performance, reduce risks, and ensure long-term sustainability.

To discuss how our Operational Audits can benefit your site or facility, contact CBM 360 TIV today.



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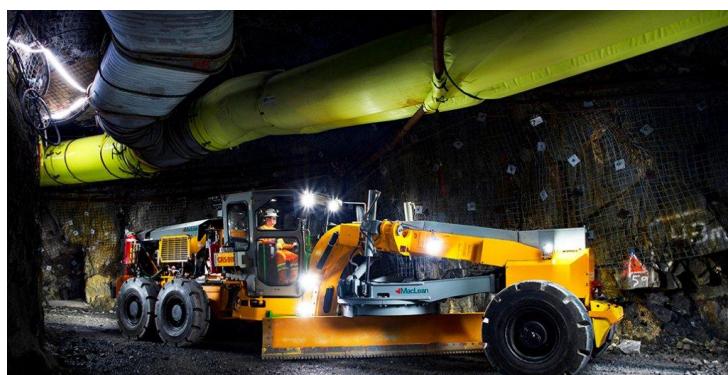
## Health, Safety, and Environmental (HSE) Audit



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Enhance workplace safety, regulatory compliance, and operational efficiency across Mining, Oil & Gas, FPSO/FSO, Power, and Industrial Facilities.

In today's high-risk industrial environments, proactive management of Health, Safety, and Environmental (HSE) risks is essential to avoid costly incidents, regulatory non-compliance, and operational disruption. CBM 360 TIV's HSE Audit Services provide a structured and comprehensive evaluation of your organization's safety practices, management systems, and legal compliance to ensure safe and efficient operations.

### Why Choose HSE Audit from CBM 360 TIV?



We can help you:

- Identify gaps in your HSE management system and improve regulatory compliance
- Assess adherence to local, national, and international safety laws and environmental regulations
- Benchmark your site performance against industry best practices and global standards
- Mitigate operational risks and reduce accident frequency
- Improve safety culture and promote employee accountability



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- Support ISO certification or preparation for third-party regulatory audits
- Provide actionable recommendations for immediate and long-term improvement
- Enhance environmental responsibility and sustainable operational practices

## Trusted HSE Auditors with Global Reach

As a leading provider of inspection, verification, and auditing services, CBM 360 TIV delivers independent and unbiased HSE audits conducted by experienced auditors, safety engineers, and compliance specialists. Our team holds certifications in ISO 45001, ISO 14001, NEBOSH, and OSHA and provides real-world insights that help prevent incidents and enhance safety programs.

## Industry Expertise That Delivers Results

Our auditors have decades of experience in:

- ❖ Mining and Metal Plants – Crusher zones, conveyors, explosive zones, haulage safety
- ❖ Industrial Manufacturing & Processing Plants – Assembly lines, robotic cells, chemical safety
- ❖ Oil & Gas (Onshore/Offshore) – Wellheads, pipelines, gas separators, flare systems
- ❖ FPSO & FSO Vessels – Confined space entry, tank entry procedures, lifting & hoisting operations
- ⚡ Power & Utilities (Hydro, Thermal, Gas, Geo-Thermal) – High-voltage equipment, boiler safety, turbine areas

## Our HSE Audit Services Include:

- Full HSE Management System Audits (aligned with ISO 45001 / ISO 14001)
- Regulatory compliance checks for local and international laws
- Behavioural safety observations and leadership engagement evaluations
- Workplace risk assessments (e.g., hazard identification, PPE usage, lockout/tagout practices)
- Environmental audits (e.g., emissions, effluent discharge, waste management)
- Emergency preparedness and fire safety reviews
- Permit-to-work system audits and contractor HSE compliance
- Detailed audit reports with non-conformance listing and corrective action plans

## Standards & Guidelines We Follow:

- ISO 45001 – Occupational Health & Safety Management Systems
- ISO 14001 – Environmental Management Systems
- OSHA 1910/1926 – U.S. Occupational Safety Standards
- ILO Guidelines – International Labour Organization Safety Framework



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- NEBOSH / IOSH / OSHA / NFPA – Auditor and Safety Officer Certifications
- Local regulatory bodies and industry-specific HSE policies



### Ready to Improve Your HSE Performance?

Let our certified HSE professionals audit your systems, uncover risk areas, and help build a safer, more compliant, and more efficient workplace — no matter your industry or location.

To discuss how our HSE Audit Services can support your operational safety goals, contact CBM 360 TIV today.

## Fire and Safety Audit (F&S)



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Enhance fire protection, safety compliance, and risk mitigation across Mining and Metal Plants, Oil & Gas Facilities, FPSO/FSO Vessels, Industrial Plants, and Power & Utility Infrastructure.

Fire and safety risks pose critical challenges during both commissioning and operational phases of industrial facilities. CBM 360 TIV's Fire and Safety Audit Services provide a systematic evaluation of your fire protection systems, safety practices, and emergency preparedness to help you minimize hazards, meet legal obligations, and ensure the safety of your workforce and assets.

### Why Choose Fire and Safety Audit from CBM 360 TIV?



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**We can help you:**

- Identify fire hazards and life safety risks across your plant or facility
- Ensure compliance with national and international fire safety codes
- Evaluate fire detection, alarm, suppression, and evacuation systems
- Review storage and handling of flammable materials
- Audit the adequacy of firefighting equipment and accessibility
- Analyse and verify emergency response plans and drills
- Assess training adequacy and PPE use for firefighting and rescue teams
- Provide recommendations to improve safety culture and reduce incident rates

### Trusted Safety Auditors with Proven Industry Expertise

CBM 360 TIV's certified safety engineers and fire protection professionals conduct comprehensive, impartial safety audits using globally recognized practices and protocols.

We assess all elements of your fire and safety systems — from design and installation to maintenance and readiness — ensuring your operations meet legal and insurance requirements while safeguarding lives and property.

### Industry Coverage with Global Expertise

Our audit services support diverse sectors including:

- ❖ Mining and Metal Plants – Conveyor galleries, storage silos, mobile equipment zones
- ❖ Industrial Manufacturing & Processing Plants – Production lines, paint shops, storage tanks
- ❖ Oil & Gas (Onshore/Offshore) – Flammable storage areas, process units, control rooms
- ❖ FPSO & FSO Vessels – Engine rooms, cargo tanks, helidecks, accommodation modules
- ❖ Power & Utilities (Thermal, Coal, Hydro, Gas, Geo Thermal) – Turbine halls, transformers, switchyards



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## Our Fire and Safety Audit Services Include:

- Evaluation of fire risk assessments and zone classification
- Inspection of fire detection, suppression, and alarm systems
- Verification of firewater systems, hydrants, extinguishers, and hoses
- Review of emergency lighting and signage
- Testing of emergency exit routes, muster points, and response systems
- Analysis of safety documents, permits, and HAZOP studies
- Training & awareness evaluation for emergency teams
- Preparation of a detailed audit report with risk ratings and improvement plan

## Standards and Guidelines We Follow:

- NFPA (National Fire Protection Association) Codes and Standards
- OSHA 1910 / OSHA 1926 – Occupational Safety and Health Standards
- IS 2190 / IS 14489 – Indian Fire Safety and Audit Guidelines
- API RP 752 / 753 – Facility Siting & Hazardous Materials Handling
- ISO 45001 – Occupational Health & Safety Management Systems
- Factory Act / Explosive Act / Fire Services Act – Local regulatory codes
- Project-specific or EPC-client HSE & Fire Safety Specifications



## Ready to Audit Your Fire Safety Performance?

Let CBM 360 TIV help you identify fire safety gaps, reduce accident potential, and improve compliance with local and international fire safety norms.

To discuss how our Fire and Safety Audit Services can enhance the safety and resilience of your facilities, contact CBM 360 TIV today.



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## Asset Integrity Management (AIM) Audit



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Assure the fitness-for-service, reliability, and safety of critical assets across Mining, Oil & Gas, FPSO/FSO, Industrial Processing Plants, and Power & Utility sectors.

Asset failures can result in catastrophic safety, environmental, and financial consequences. CBM 360 TIV's Asset Integrity Management (AIM) Audit Services are designed to evaluate, verify, and improve the effectiveness of your asset integrity systems — ensuring operational reliability, risk mitigation, and regulatory compliance throughout your asset lifecycle.

### Why Choose Asset Integrity Audit from CBM 360 TIV?



We can help you:

- Evaluate the effectiveness of your AIM systems across static, rotating, electrical, and structural assets
- Benchmark asset performance against industry standards and best practices
- Identify gaps in risk management, inspection, maintenance, and documentation
- Improve asset reliability, reduce unplanned downtime, and enhance HSE compliance
- Ensure Regulatory, OEM, API, ASME, and ISO compliance for safety-critical equipment
- Validate the fitness-for-service (FFS) of aging assets, piping, tanks, and pressure systems
- Develop or upgrade Asset Integrity Management Programs (AIMP)
- Receive comprehensive audit reports and strategic recommendations for lifecycle planning



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Trusted AIM Auditors for High-Risk Industrial Sectors

With decades of experience across high-risk industrial environments, CBM 360 TIV's team of certified inspectors and engineers conduct independent AIM audits to assess the performance and compliance of your integrity systems. Whether you're preparing for a shutdown, responding to an incident, or building a long-term reliability strategy — we deliver trusted insights and practical solutions.

## Global Experience Across Critical Infrastructure

Our experts have delivered AIM audits for:

- ❖ Mining & Metal Plants – Hoists, crushers, conveyors, slurry pipelines
- ❖ Industrial Manufacturing & Processing Plants – Vessels, furnaces, tanks, and process piping
- ❖ Oil & Gas (Onshore & Offshore) – Pressure systems, flare systems, flowlines, jackets, subsea tiebacks
- ❖ FPSO & FSO Vessels – Hull structures, topsides, turret systems, mooring integrity
- ❖ Power & Utilities (Hydro, Thermal, Gas, Coal, Geo Thermal) – Boilers, turbines, transformers, cooling systems

## Our AIM Audit Services Include:

- Asset Risk Categorization and Criticality Ranking
- Review of Inspection & Maintenance Records
- Fitness-for-Service (FFS) Assessments
- Review of RBI, RCM, and SIL strategies
- Gap analysis of your AIM policies and procedures
- Life extension strategies for aging assets
- Coating & corrosion management program reviews
- Mechanical Integrity (MI) audits for pressure equipment and pipelines
- Shutdown & turnaround integrity readiness audits
- Final audit report with action plan and optimization strategies

## Standards We Follow:

- API 580/581 – Risk-Based Inspection (RBI)
- API 579 – Fitness-for-Service (FFS)
- ASME B31.3 / B31.8 / Section VIII / Section IX – Piping and pressure vessel codes



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- ISO 55001 – Asset Management Systems
- DNV-RP-C203 / DNVGL-RP-G101 – Offshore structural integrity
- NORSO, IEC 61508/61511, NACE MR0175/ISO 15156, and other industry-specific standards
- Client-specific OEM, EPC, and regulatory requirements



### **Ready to Maximize Your Asset Lifespan?**

CBM 360 TIV is your trusted partner for Asset Integrity Audits — ensuring safety, compliance, and performance from startup to decommissioning.

To learn how our Asset Integrity Management Audit Services can enhance your risk mitigation and asset lifecycle planning, contact CBM 360 TIV today.

## **Production Import/Export Audit**



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure regulatory compliance, traceability, and operational integrity for global production logistics across Mining, Oil & Gas, FPSO/FSO, Petrochemical, Industrial, and Power Plant operations.

In an increasingly globalized supply chain, managing the production, import, and export of equipment, raw materials, and finished goods is critical to project efficiency and regulatory compliance. CBM 360 TIV's Production Import/Export Audit Services ensure that your cross-



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Written by: Budagatla Satish

border production and trade operations meet all statutory, technical, and quality assurance requirements — minimizing customs delays, avoiding non-compliance penalties, and ensuring seamless logistics.

## Why Choose Import/Export Audits from CBM 360 TIV?



We can help you:

- Verify compliance with international trade regulations, tariffs, and licensing
- Conduct full audits of production batch records, customs documentation, and HS codes
- Ensure conformity with origin rules, certificates, and dual-use material compliance
- Detect logistics bottlenecks and implement corrective actions
- Identify non-compliant or counterfeit materials or components
- Conduct third-party verification of supplier production output and export packaging standards
- Optimize shipping documentation and customs clearance workflows
- Comply with local port, customs, and international trade authorities (WCO, WTO, etc.)

## Global Trade Assurance You Can Trust

As a global leader in quality assurance and verification, CBM 360 TIV brings deep expertise in auditing production and trade flows for high-value industrial and energy projects. Our qualified auditors and trade compliance experts operate across continents, helping you navigate complex import/export requirements without delay or disruption.

## Industry Expertise Across Borders

We support global supply chain compliance for:

- ❖ Mining and Metal Projects – Raw ore exports, equipment imports audits, smelting material flows
- ❖ Industrial Manufacturing Plants – Machine tools, fabrication inputs, export packaging audits
- ❖ Oil & Gas Facilities – Equipment skids, chemical import audits, export certification of spare parts



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⚑ FPSO & FSO Vessels – Cross-border equipment movement, classified export compliance

⚡ Power & Utilities Projects – Turbine imports, electrical panels, transformer component audits

### Our Import/Export Audit Services Include:

- Trade compliance assessment (import/export permits, end-user declarations)
- Production output tracking vs. export logs
- HS code classification review and validation
- Verification of customs invoices, bill of lading, packing lists, and COO documents
- Country of origin verification
- Export control compliance for dual-use or restricted goods
- Audit of bonded warehouse and free trade zone records
- Third-party inspections of containers, packaging, and labelling standards

### Standards & Guidelines We Follow:

- World Customs Organization (WCO) – Harmonized System Codes and customs protocols
- WTO Trade Facilitation Agreement (TFA) – Best practices for customs and logistics
- ISO 28000 – Supply chain security management systems
- EU & US Export Control Laws – EAR, ITAR, and dual-use compliance
- Local customs authority and Ministry of Trade regulations
- EPC, OEM, and project-specific global trade policies



### Ready to Ensure Trade Compliance and Flow?

Partner with CBM 360 TIV to ensure your production, import, and export activities comply with global standards while minimizing delays and operational risks.

To discuss how our Production Import/Export Audit Services can enhance your global supply chain assurance, contact CBM 360 TIV today.



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## Financial Audit



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Safeguard your assets, ensure regulatory compliance, and enhance stakeholder confidence across Mining & Metals, Oil & Gas, FPSO/FSO, Industrial, and Power Sectors.

In today's dynamic business environment, maintaining transparency, accountability, and financial integrity is essential. CBM 360 TIV's Financial Audit Services help you strengthen internal controls, verify compliance with local and international regulations, and deliver confidence to shareholders and regulators — whether during operational phases or international expansion.

### Why Choose Financial Audit from CBM 360 TIV?



We can help you:

- Ensure accurate financial reporting in accordance with global accounting standards (IFRS, GAAP)
- Identify internal control weaknesses and recommend improvements
- Reduce risk of fraud, misstatements, and financial discrepancies
- Ensure regulatory and statutory compliance in local and international jurisdictions
- Enhance investor and stakeholder confidence with third-party verification
- Conduct due diligence audits for acquisitions, partnerships, and joint ventures
- Improve corporate governance and risk management frameworks
- Provide detailed audit reports and financial recommendations to support decision-making



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## Trusted Financial Assurance from Certified Professionals

With a global network of certified auditors, accountants, and financial analysts, CBM 360 TIV brings deep sector knowledge and best practices to your business. Our independent, impartial, and comprehensive financial audits ensure your business is operating with maximum integrity and in full compliance with applicable laws and industry norms.

### Global Financial Oversight Across All Industries

Our financial audit services are tailored to the complex needs of industries such as:

- ❖ Mining & Metals – Capital investment tracking, cost analysis, and resource accountability
- ❖ Industrial Manufacturing & Processing – Inventory audits, CAPEX controls, and cost verification
- ❖ Oil & Gas (Onshore & Offshore) – Joint venture audits, royalty audits, production sharing agreements
- ❖ FPSO & FSO Operations – Project-based accounting, lease auditing, OPEX/CAPEX reconciliation
- ❖ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Tariff analysis, asset audit, and financial modelling

### Our Financial Audit Services Include:

- Statutory & Regulatory Audits
- Internal Control Assessment (SOX, COSO frameworks)
- Risk-Based Financial Audits
- Joint Venture & Partner Audits
- Production Sharing & Revenue Audits
- Fraud Risk Assessments & Forensic Auditing
- Tax Compliance Audits (Direct/Indirect Taxes)
- Financial Due Diligence for M&A and Investments
- Project Cost Audits and Financial Forecast Reviews
- Compliance Audits with donor, lender, and grant guidelines

### Standards We Follow:

- IFRS (International Financial Reporting Standards)
- US GAAP / Local GAAP
- ISA (International Standards on Auditing)
- SOX (Sarbanes-Oxley Act)



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- COSO Framework for Internal Controls
- OECD Guidelines on Transfer Pricing
- Country-specific tax and financial audit regulations



### Ready to Strengthen Your Financial Integrity?

Let our expert financial audit team help you reduce business risk, improve transparency, and ensure regulatory compliance across all your operations — from mining and industrial plants to offshore energy assets.

To discuss how CBM 360 TIV Financial Audit Services can support your business goals, contact us today.



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### 16.5 Verification & Certification (VC)



**Production Import / Export Verification & Certification**



**Asset Integrity & Fitness Verification & Certification**



**Environmental Damage Verification & Certification**



**Pressure Vessels and Boilers Verification & Certification**



**Turbines, Generators, Engines & Compressors Verification & Certification**



**Pipeline Integrity Verification & Certification**



**Storage Tank Facilities Verification & Certification**



**Fitness Verification & Certification for Heavy Mining Equipment**



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## Production Import / Export Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure global trade compliance, quality assurance, and regulatory integrity for industrial products across Mining, Oil & Gas, Manufacturing, FPSO/FSO, and Power Sectors.

In a global marketplace, compliance with international trade, safety, and quality regulations is essential for the movement of goods across borders. CBM 360 TIV's Import / Export Verification & Certification Services ensure that your industrial materials, equipment, and systems meet contractual, regulatory, and customer requirements — reducing delays, penalties, and risk of non-compliance.

### Why Choose Import / Export Verification from CBM 360 TIV?



We can help you:

- Ensure product conformity with international codes, customer specs, and trade regulations
- Perform pre-shipment inspections (PSI) and final quality checks
- Monitor packaging, marking, labelling, and documentation compliance
- Facilitate customs clearance and port authority approvals
- Verify equipment certifications, mill test reports, dimensional checks, and serial traceability
- Reduce rejections, port holds, and shipment delays
- Maintain full supply chain transparency
- Ensure compliance with destination country standards, including CE, PED, API, ISO, ASME, and others



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## Global Trade Compliance with Local Expertise

With a global network of qualified inspectors, CBM 360 TIV supports your international procurement, delivery, and logistics operations from factory to final destination — ensuring that your critical equipment meets all specifications before shipment and after arrival.

Whether you're exporting machinery from a fabrication yard or importing OEM parts into project sites, our independent verification services provide confidence and compliance.

### Industries We Serve:

- Oil & Gas (Onshore/Offshore) – Export of risers, separators, wellheads, flanges, valves
- ◊ Industrial Manufacturing & Processing – Verification of pumps, compressors, skids, panels
- Mining and Metals – Inspection of crushing systems, gearboxes, piping assemblies
- FPSO & FSO – Procurement QA of topside modules, pressure vessels, pipe spools
- ⚡ Power Plants (Thermal, Hydro, Gas) – Verification of turbines, transformers, switchgear

### Our Import / Export Verification & Certification Services Include:

- Pre-dispatch inspection (PDI)
- Factory acceptance tests (FAT) and witness testing
- Dimensional and visual inspection
- Review of Material Test Certificates (MTC) and QA/QC dossiers
- Packing list and marking verification
- Supervision of loading, container stuffing, and securing
- Customs document verification (COC, COO, invoice validation)
- Final Inspection Release Note (IRN) and compliance reports

### International Standards We Follow:

- ISO/IEC 17020 – Requirements for inspection bodies
- ISO 2859 / ISO 3951 – Sampling procedures for inspections
- API Q1/Q2, ASME Section VIII, PED/CE Compliance – Equipment certification
- IEC, ANSI, IEEE, EN – Electrical and mechanical export specifications
- National & Port Authority Requirements – As per importing country regulations
- Project-specific OEM or EPC guidelines



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### Ensure Quality and Compliance Across Borders

CBM 360 TIV is your trusted partner for end-to-end inspection, verification, and certification for international trade, giving you the assurance that your materials are fit for purpose, fully compliant, and ready for safe, on-time delivery.

Contact CBM 360 TIV today to discuss how our Production Import / Export Verification Services can secure your global supply chain.

## Asset Integrity & Fitness Verification & Certification



From CBM 360 TIV – Ensure the structural soundness, safety, and compliance of your critical assets in Mining, Oil & Gas, FPSO/FSO Vessels, Power Plants, and Industrial Facilities.

In high-risk industrial environments, Asset Integrity and Fitness-for-Service (FFS) verification is critical for operational safety, risk reduction, and regulatory compliance. CBM 360 TIV offers independent and certified verification services to assess the condition, durability, and service readiness of your equipment and infrastructure — ensuring continued safe operation and life-extension of your assets.

### Why Choose Asset Integrity & Fitness Certification from CBM 360 TIV?



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**We help you:**

- Validate the mechanical and structural integrity of pressure equipment, piping, tanks, and steel structures
- Perform Fitness-for-Service assessments (FFS) to API 579 and equivalent standards
- Detect critical flaws, corrosion, erosion, cracking, fatigue, and material degradation
- Certify equipment for continued safe operation beyond design life
- Assess risk using RBI (Risk-Based Inspection) and RCM (Reliability-Centered Maintenance) methodologies
- Support regulatory compliance with local laws, API, ASME, ISO, and DNV codes
- Optimize maintenance planning, life extension strategies, and inspection intervals
- Prevent catastrophic failures through early fault detection and engineering assessments

## Trusted Fitness-for-Service Evaluations by Certified Experts

With a proven track record in Asset Integrity Management (AIM), CBM 360 TIV deploys a multidisciplinary team of certified engineers, metallurgists, and inspectors who use advanced evaluation tools and international methodologies to deliver comprehensive FFS assessments and fitness certifications.

We combine engineering calculations, inspection data, material testing, and NDT evaluations to determine the actual remaining life and structural safety of your asset.

## Global Support Across All Industrial Sectors

Our Asset Integrity and FFS services cover:

- Oil & Gas Onshore/Offshore – Pressure vessels, risers, separators, pipelines
- FPSO/FSO Vessels – Hull integrity, topside modules, process piping
- Industrial Processing Facilities – Heat exchangers, tanks, reactors, furnaces
- Power Plants (Thermal, Hydro, Gas, Geo) – Boilers, steam drums, piping, condensers
- ◀ Mining & Metal Plants – Structural conveyors, crushers, load-bearing assets



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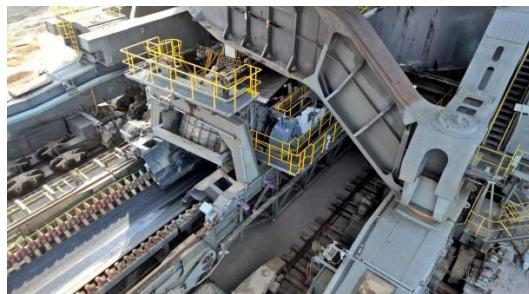
Written by: Budagatla Satish

## Our Asset Integrity & Fitness Services Include:

- In-service inspection & corrosion mapping
- Pressure equipment integrity audits (PEIA)
- FFS evaluations as per API 579-1/ASME FFS-1
- Structural integrity assessments (FEA & stress analysis)
- RBI program development and implementation
- Weld integrity, creep damage, and fatigue analysis
- Re-rating and re-certification of aged assets
- Reporting with actionable repair and mitigation strategies

## Standards We Follow:

- API 579-1 / ASME FFS-1 – Fitness-for-Service Assessment
- API 510 / API 570 / API 653 – Pressure Vessel, Piping, and Tank Inspection Codes
- ISO 24817 / DNV-RP-C203 / BS 7910 – Composite repairs, fatigue, flaw assessment
- ASME VIII / B31.3 / ISO 5817 / DNV-ST-F101 – Design and operational fitness
- RBI/RCM principles – Risk and reliability-based integrity strategy



## Ensure Safe and Compliant Operations

Extend the life, reduce the risk, and guarantee the compliance of your assets with CBM 360 TIV's Asset Integrity and Fitness Verification services.

To discuss how our Fitness-for-Service and Certification Solutions can support your operational goals and regulatory needs, contact CBM 360 TIV today.



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## Environmental Damage Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Identify, assess, and mitigate environmental damage risks across Mining, Oil & Gas, Industrial Plants, FPSO/FSO Vessels, and Power Infrastructure.

In today's globally regulated industrial landscape, verifying and certifying environmental damage is critical to ensuring compliance, maintaining sustainability, and protecting both ecosystems and reputations. CBM 360 TIV's Environmental Damage Verification & Certification Services provide a structured, science-based approach to detect, document, and certify the extent and source of environmental degradation caused by industrial activities.

### Why Choose Environmental Certification from CBM 360 TIV?



We can help you:

- Identify and verify the extent of environmental contamination (air, water, soil, noise)
- Provide third-party environmental audits and documentation for regulators
- Determine the cause, impact, and scope of environmental damage
- Support incident investigations, environmental liabilities, or pollution claims
- Ensure compliance with local, national, and international environmental laws
- Evaluate environmental risk during construction, operation, and decommissioning phases
- Provide recommendations for remediation, mitigation, or restoration strategies
- Assist in ISO 14001 Environmental Management System (EMS) implementation and certification



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Independent Environmental Assessments by Trusted Experts

With a global network of certified environmental professionals, CBM 360 TIV offers independent, third-party verification of environmental damage backed by laboratory testing, remote sensing, drone inspection, and regulatory audit protocols.

Our teams are experienced in working with multinational EPC contractors, industrial operators, government agencies, and NGOs, ensuring credible and actionable findings for even the most complex projects.

### Global Reach, Industry-Specific Expertise

Our environmental damage verification services support a wide range of industries:

- ❖ Mining & Metallurgy – Tailings leakage, acid mine drainage, dust emissions
- ❖ Industrial Manufacturing Plants – Waste disposal, noise, and effluent discharge
- ❖ Oil & Gas (Onshore/Offshore) – Oil spills, gas flaring, produced water discharges
- ❖ FPSO & FSO Vessels – Sludge disposal, ballast water impact, corrosion product leaks
- ⚡ Power & Utilities – Thermal discharge, ash pond leakage, fuel storage contamination

### Our Environmental Verification Services Include:

- Soil and groundwater sampling and contamination analysis
- Air quality and gas emission testing (NOx, SOx, CO, VOCs)
- Surface water & wastewater quality analysis
- Remote sensing for large-scale vegetation loss and erosion
- Environmental impact report (EIR) preparation
- Environmental damage root cause analysis
- Hazardous material spill inspection and containment auditing
- Ecosystem impact evaluation and mapping
- Documentation for insurance, compliance, or litigation purposes

### Standards & Guidelines We Follow:

- ISO 14001 – Environmental Management Systems
- ISO 19011 – Guidelines for Environmental Auditing
- EPA Guidelines – Local and international environmental protection regulations
- IFC Performance Standards – Environmental & social sustainability for industrial projects
- OECD Guidelines – Environmental due diligence and corporate responsibility
- MARPOL / OSPAR / Basel Convention – For marine and offshore pollution cases
- National regulatory frameworks (e.g., NEMA, EPA, CPCB, MoEF&CC, etc.)



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## Ready to Certify Environmental Compliance?

Whether you're facing a regulatory inspection, responding to an environmental incident, or planning to enhance your sustainability profile, CBM 360 TIV is your trusted partner.

Let our environmental verification and certification experts help you minimize risk, restore compliance, and build stakeholder trust — across all industrial sectors worldwide.

Contact CBM 360 TIV to learn how our Environmental Damage Verification & Certification services can support your projects.

## Pressure Vessels and Boilers Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure safety, compliance, and operational reliability of pressure vessels and boilers across Mining, Oil & Gas, FPSO/FSO, Industrial Plants, and Power Utilities.

Pressure vessels and boilers are critical components in many industrial processes where failure can lead to catastrophic consequences. CBM 360 TIV's Verification, Inspection, and Certification Services provide comprehensive assessments to ensure your equipment meets stringent safety codes, operational standards, and regulatory requirements — protecting your personnel, assets, and environment.

## Why Choose Pressure Vessels and Boilers Verification from CBM 360 TIV?



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**We can help you:**

- Verify design and manufacturing compliance against ASME, API, ISO, and local regulatory standards
- Perform thorough inspections for structural integrity, corrosion, fatigue, and welding quality
- Conduct non-destructive testing (NDT) including ultrasonic thickness measurements, radiography, magnetic particle, and dye penetrant testing
- Execute pressure and hydrostatic testing to validate vessel and boiler strength under operating conditions
- Assess safety valves, controls, and instrumentation functionality
- Provide third-party QA/QC oversight with detailed inspection reports and certification documentation
- Support risk-based inspection (RBI) programs and asset integrity management
- Facilitate compliance with insurance and statutory body requirements

## Trusted Inspection and Certification by Industry Experts

CBM 360 TIV's team of certified pressure vessel and boiler inspectors deliver precise, reliable verification services — onsite, workshop, or offshore — backed by advanced diagnostic tools and expert technical knowledge.

Our specialists ensure your pressure equipment is safe, compliant, and ready for operation under the most demanding conditions.

## Industry Experience & Global Reach

Our experienced inspectors support clients worldwide across:

- Oil & Gas Onshore and Offshore Facilities – Pressure vessels, separators, and process boilers
- FPSO & FSO Vessels – Boilers, heat exchangers, and pressure tanks
- Industrial Manufacturing & Processing Plants – Boilers and pressure vessels for chemical, petrochemical, and manufacturing applications
- ⚡ Power Plants (Thermal, Coal, Gas, Hydro) – Steam boilers, pressure vessels, and auxiliaries
- ❖ Mining Operations – Pressure equipment essential for mineral processing and slurry handling



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Written by: Budagatla Satish

## Our Pressure Vessels and Boilers Verification Services Include:

- Visual and dimensional inspection of vessel components and welds
- Ultrasonic thickness testing for corrosion and erosion monitoring
- Radiographic and dye penetrant testing for weld integrity
- Magnetic particle inspection of pressure-containing parts
- Hydrostatic and pneumatic pressure testing
- Safety valve and control system inspection and testing
- Certification documentation and compliance reporting

## Standards We Follow:

- ASME Boiler & Pressure Vessel Code (BPVC)
- API 510 / API 570 – Pressure vessel and piping inspection codes
- ISO 16528 / ISO 9001 – Quality management and inspection standards
- NACE, BGAS-CSWIP, and client-specific project standards



## Ready to Secure Your Pressure Equipment?

Partner with CBM 360 TIV for expert verification and certification of your pressure vessels and boilers — ensuring compliance, safety, and uninterrupted operation.

Contact CBM 360 TIV today to discuss how our services can safeguard your critical assets.



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# Turbines, Generators, Engines & Compressors Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure optimal performance, reliability, and safety of turbines, generators, engines, and compressors across Mining, Oil & Gas, FPSO/FSO, Industrial Plants, and Power Utilities.

Rotating machinery such as turbines, generators, engines, and compressors are vital for efficient operation in many industries. CBM 360 TIV's Verification, Inspection, and Certification Services deliver comprehensive assessments to guarantee equipment integrity, operational safety, and compliance with international standards — maximizing uptime and minimizing risks.

## Why Choose Turbines, Generators, Engines & Compressors Verification from CBM 360 TIV?



We can help you:

- Verify equipment condition and operational readiness through detailed inspections and testing
- Perform vibration analysis, thermal imaging, and lubrication assessments to detect early faults
- Inspect mechanical components including shafts, bearings, couplings, and seals for wear and damage
- Conduct performance testing and operational verification under real load conditions
- Ensure compliance with OEM specifications and industry standards such as ISO, API, and IEC
- Provide third-party QA/QC verification and certification for new installations, repairs, and overhauls
- Support predictive and preventive maintenance programs to extend asset life



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- Facilitate safe and reliable plant operation minimizing unexpected downtime

## Trusted Verification & Certification by Industry Experts

CBM 360 TIV's certified inspectors and engineers combine advanced diagnostic tools with deep technical expertise to deliver precise and reliable machinery verification services — performed on-site, workshop, or offshore.

Our professionals ensure your rotating equipment meets stringent quality, safety, and performance benchmarks.

## Industry Experience & Global Reach

Our expert teams serve clients globally across:

- ⚡ Power Plants (Thermal, Hydro, Gas, Coal) – Steam and gas turbines, generators, auxiliary engines
- โรงแ� Oil & Gas Facilities Onshore & Offshore – Compressors, diesel engines, gas turbines
- 🚢 FPSO & FSO Vessels – Marine engines, power generators, compressor packages
- 🏭 Industrial Manufacturing & Processing Plants – Large engines, compressors, and generator sets
- ⛏ Mining Operations – Heavy-duty engines, compressors, and power generation equipment

## Our Turbines, Generators, Engines & Compressors Verification Services Include:

- Visual and dimensional inspections of critical components
- Vibration and acoustic emission analysis for fault detection
- Thermographic inspection to identify overheating or insulation faults
- Lubrication oil analysis and monitoring
- Operational performance and load testing
- Alignment and balancing checks
- Certification documentation and compliance reporting

## Standards We Follow:

- ISO 10816 / ISO 7919 – Vibration condition monitoring and diagnostics
- API 670 / API 618 – Machinery protection systems and reciprocating compressors
- IEC 60034 – Rotating electrical machines
- OEM Manufacturer Specifications and client-specific standards
- BGAS-CSWIP, NACE, and other relevant certifications



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### Ready to Maximize Your Equipment Performance?

Partner with CBM 360 TIV for expert verification and certification services for turbines, generators, engines, and compressors — ensuring safe, efficient, and compliant operations.

Contact CBM 360 TIV today to discuss how our specialized services can support your rotating machinery assets.

## Pipeline Integrity Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Safeguard the safety, reliability, and longevity of pipeline infrastructure across Mining, Oil & Gas, FPSO/FSO, Industrial, and Power sectors.

Pipelines are vital assets for transporting fluids and gases safely over long distances. Ensuring their structural integrity and operational reliability is critical to prevent leaks, environmental hazards, and costly downtime. CBM 360 TIV's Pipeline Integrity Verification and Certification Services deliver thorough assessments and monitoring solutions to maintain pipeline performance and compliance with global standards.

### Why Choose Pipeline Integrity Verification & Certification from CBM 360 TIV?



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**We can help you:**

- Conduct comprehensive integrity assessments for onshore and offshore pipelines
- Perform Non-Destructive Testing (NDT) such as ultrasonic testing (UT), radiography (RT), magnetic flux leakage (MFL), and smart pigging
- Detect corrosion, cracks, weld defects, and mechanical damage early to prevent failures
- Monitor pipeline coating condition and cathodic protection effectiveness
- Provide engineering evaluations, risk-based inspections, and fitness-for-service (FFS) analysis
- Support pipeline repair, rehabilitation, and life extension planning
- Certify pipeline systems in compliance with API, ASME, ISO, and local regulations
- Deliver third-party verification and quality assurance throughout pipeline lifecycle

## Trusted Integrity Services by Industry Experts

CBM 360 TIV offers a global team of certified pipeline inspectors, NDT specialists, and engineers with extensive experience in pipeline integrity management for oil, gas, mining, and industrial pipelines — onshore and offshore.

Our experts ensure your pipeline assets maintain optimal safety and performance standards.

## Industry Experience & Global Reach

We serve clients worldwide with experience in:

- Oil & Gas Pipelines – Gathering, transmission, distribution, and export pipelines
- Industrial and Process Plant Pipelines – Chemical, slurry, water, and steam pipelines
- FPSO & FSO Pipeline Systems – Subsea and topside pipeline verification
- ⚡ Power Plants – Fuel, water, and auxiliary pipelines

## Our Pipeline Integrity Verification Services Include:



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- Visual and detailed pipeline inspections
- Non-destructive testing (ultrasonic, radiography, magnetic flux leakage, smart pigging)
- Coating inspection and cathodic protection monitoring
- Corrosion assessment and corrosion under insulation (CUI) detection
- Weld and joint integrity testing
- Fitness-for-service evaluations and risk-based inspection ( RBI) planning
- Leak detection surveys and pressure testing
- Compliance reporting and certification

### Standards We Follow:

- API 570 – Piping Inspection Code
- API 653 – Tank Inspection, Repair, Alteration, and Reconstruction (for tank-to-pipeline interfaces)
- ASME B31.3 / B31.4 / B31.8 – Process, Liquid, and Gas Transmission Piping Codes
- ISO 3183 – Petroleum and natural gas industries – Steel pipe for pipeline transportation systems
- NACE SP0102 / NACE SP0169 – Pipeline corrosion control
- Project-specific OEM or EPC client standards



### Ready to Ensure Pipeline Safety & Reliability?

Trust CBM 360 TIV to provide expert pipeline integrity verification and certification services that maximize safety, operational uptime, and regulatory compliance across your pipeline assets.

Contact CBM 360 TIV today to discuss how we can support your pipeline integrity management needs.



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# Industrial Structural Health Monitoring and Fitness Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure structural integrity, safety, and prolonged asset life for Mining, Oil & Gas, FPSO/FSO, Industrial, and Power sector infrastructures.

In any industrial facility, the health and fitness of structural components are paramount to operational safety and efficiency. CBM 360 TIV's Structural Health Monitoring and Fitness Verification Services provide continuous or periodic assessment of critical structures to detect degradation, damage, or fatigue early — helping prevent costly failures and unplanned downtime.

## Why Choose Structural Health Monitoring & Fitness Verification from CBM 360 TIV?



### We can help you:

- Implement advanced monitoring solutions to track structural behaviour and performance in real-time or scheduled intervals
- Conduct detailed inspections and fitness-for-service assessments of steel, concrete, and composite structures
- Identify corrosion, cracks, deformation, fatigue, and other integrity threats before they escalate
- Provide third-party verification and certification ensuring compliance with international codes and project-specific standards
- Support asset life extension strategies with reliable data and expert analysis
- Facilitate regulatory compliance including API, ISO, DNV, ABS, and other classification societies
- Deliver comprehensive reports, risk assessments, and maintenance recommendations



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Inspection Integrity Innovation

Written by: Budagatla Satish

## Trusted Experts in Structural Integrity and Monitoring

As a global leader in inspection, verification, testing, and certification, CBM 360 TIV provides certified structural engineers and inspection specialists to design and implement tailored monitoring programs — on-site or remote, onshore or offshore.

Our team leverages the latest sensor technologies, data analytics, and fitness assessment methodologies to ensure your structures remain safe, compliant, and fully operational.

### Extensive Experience Across All Industries

Our structural health monitoring and verification services support critical assets in:

- ❖ Mining and Metal Plants – Conveyor supports, slurry tanks, gantries, steel frameworks
- ❖ Industrial Manufacturing & Processing Plants – Pressure vessels, reactors, piping supports
- ❖ Oil & Gas Onshore/Offshore Facilities – Platforms, jackets, risers, flare stacks
- ❖ FPSO & FSO Vessels – Hull structures, ballast tanks, decks
- ⚡ Power & Utilities (Hydro, Thermal, Coal, Gas, Geo Thermal) – Cooling towers, turbine foundations, intake/outfall structures

### Our Structural Health Monitoring & Fitness Verification Services Include:

- Installation and calibration of structural sensors (strain gauges, accelerometers, displacement sensors)
- Data acquisition, real-time monitoring, and trend analysis
- Visual and NDT inspections (ultrasonic, radiography, magnetic particle)
- Structural fitness-for-service (FFS) assessments and remaining life analysis
- Load and stress analysis including finite element modelling (FEM) support
- Corrosion and crack growth monitoring
- Comprehensive integrity reports and certification documentation

### Standards We Follow:

- API 579 / ASME FFS-1 – Fitness-for-Service assessment standards
- ISO 13822 – Safety of structures — Assessment of existing structures
- DNVGL-ST-0126 / DNVGL-RP-C203 – Structural reliability and monitoring guidelines
- ABS, Lloyd's Register, Bureau Veritas – Classification society rules and survey requirements
- Project-specific OEM, EPC, or client standards



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Inspection Integrity Innovation

Written by: Budagatla Satish



### Ready to Ensure Your Structural Integrity?

Let CBM 360 TIV's expert team help you implement reliable structural health monitoring and provide fitness verification certification — protecting your assets and operational continuity worldwide.

Contact CBM 360 TIV today to learn how our Industrial Structural Health Monitoring and Fitness Verification Services can add value to your project.

## Storage Tank Facilities Verification & Certification



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure safe, compliant, and efficient storage tank operations for Mining, Oil & Gas, FPSO/FSO, Industrial Plants, and Power & Utility sectors.

Storage tanks are critical infrastructure for containing liquids and gases, requiring rigorous verification and certification to guarantee structural integrity, environmental safety, and operational reliability. CBM 360 TIV's Storage Tank Facilities Verification and Certification Services deliver comprehensive assessments to maintain asset performance and compliance with applicable standards and regulations.



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## Why Choose Storage Tank Verification & Certification from CBM 360 TIV?



We can help you:

- Verify structural integrity and operational safety of aboveground and underground storage tanks
- Conduct detailed inspections for corrosion, weld quality, deformation, and leakage risks
- Perform non-destructive testing (NDT) including ultrasonic thickness, radiography, and magnetic particle testing
- Assess foundation and secondary containment conditions for environmental protection
- Provide certification and compliance documentation aligned with API, ASME, and local regulatory requirements
- Support tank refurbishment, repair, and life extension projects with expert recommendations
- Facilitate periodic inspection programs to prevent failures and optimize maintenance schedules
- Ensure compliance with industry standards such as API 650, API 653, and local statutory regulations

## Trusted Verification & Certification by Industry Experts

CBM 360 TIV employs certified inspectors and engineers experienced in storage tank integrity management to deliver reliable verification, inspection, and certification services — onshore or offshore.

Our professionals ensure your tank facilities meet the highest standards for safety, quality, and regulatory compliance.

## Industry Experience & Global Reach

Our skilled team serves clients worldwide across:

- Oil & Gas Storage Terminals – Crude oil, refined products, and chemical storage tanks
- Industrial Manufacturing & Processing Plants – Storage for raw materials, intermediates, and finished products
- ⚡ Power Plants (Thermal, Hydro, Gas) – Fuel storage tanks and auxiliary systems
- 🚢 FPSO & FSO Vessels – Cargo and ballast tank inspection and certification



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Written by: Budagatla Satish

❖ Mining Operations – Storage tanks for process liquids and slurries

### Our Storage Tank Verification & Certification Services Include:

- Visual and detailed structural inspections
- Non-destructive testing (ultrasonic thickness, radiography, magnetic particle)
- Corrosion and coating condition assessments
- Leak detection and tightness testing
- Foundation and secondary containment evaluation
- Welding and joint inspections
- Tank calibration and volumetric measurements
- Compliance reporting and certification issuance

### Standards We Follow:

- API 650 – Welded Tanks for Oil Storage
- API 653 – Tank Inspection, Repair, Alteration, and Reconstruction
- ASME Section VIII – Pressure Vessel Code (for pressurized tanks)
- NACE SP0169 – Control of External Corrosion
- OSHA and local environmental regulations
- Project-specific OEM or EPC client standards



Ready to Ensure Your Storage Tank Safety?

Trust CBM 360 TIV to provide expert verification and certification services that safeguard your storage tank assets — maximizing safety, reliability, and regulatory compliance.

Contact CBM 360 TIV today to learn how our Storage Tank Facilities services can support your project goals.



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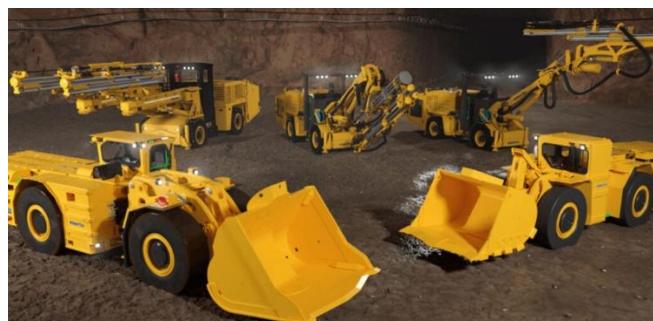
## Fitness Verification & Certification for Heavy Mining Equipment



From CBM 360 TIV - Known as Condition Based Monitoring 360° Technical Industrial Verification – Ensure safe, reliable, and regulation-compliant operation of mining and construction equipment, including Dump Trucks, Excavators, Dozers, Draglines, and Mobile Cranes.

Heavy-duty mobile equipment is the backbone of mining and construction operations. However, harsh terrain, continuous duty cycles, and material wear can compromise their structural integrity, performance, and safety over time. CBM 360 TIV's Fitness Verification & Certification Services are designed to assess and certify the health, reliability, and compliance of your mobile heavy machinery — reducing downtime and enhancing worker and equipment safety.

### Why Choose Fitness Certification from CBM 360 TIV?



We can help you:

- Evaluate the structural condition of mining dumpers, dozers, draglines, and cranes
- Ensure compliance with DGMS, ISO, BIS, OEM, and statutory authority requirements
- Perform mechanical integrity assessments through NDT & condition monitoring methods
- Conduct fitness-for-service (FFS) evaluations for extended life and continued operation
- Reduce risk of unplanned failures, mechanical breakdowns, or safety incidents
- Issue third-party fitness certificates for regulatory submission or insurance coverage
- Assess overloading effects, weld fatigue, crack propagation, and corrosion
- Optimize your maintenance planning and asset lifecycle extension strategy

### Equipment Types Covered



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Written by: Budagatla Satish

Our certified engineers and inspectors specialize in all major mobile equipment used in mining, infrastructure, and heavy industry:

- トラック Mining Dumpers & Haul Trucks – Frame weld inspection, axle housing, load-bearing systems
- 挖掘機 Hydraulic and Crawler Excavators – Boom, stick, chassis structure, slewing rings
- 推土機 Dozers & Bulldozers – Blade assembly, frame structure, sprocket systems
- 起重機 Automobile & Mobile Cranes – Telescopic boom, outriggers, rotation system, hooks
- 拖線機 Draglines & Shovels – Bucket ropes, drag ropes, fairleads, load frame welds

### Our Fitness Verification & Certification Services Include:

- Visual & dimensional inspection of load-bearing structures
- NDT (UT, MT, PT, RT, PAUT, TOFD) for welds, cracks, and fatigue zones
- Vibration and acoustic monitoring for rotating parts and slewing systems
- Load testing & structural deflection analysis under operational or simulated loads
- Corrosion assessment and thickness gauging (UTG)
- Weld repair verification & re-certification of structural repairs
- Fitness-for-Service (FFS) analysis as per API 579 / ASME FFS-1
- Detailed inspection reports, repair recommendations, and fitness certification

### Standards We Follow:

- ISO 13822 / ISO 16228 – Structural reliability of machinery
- IS 13367, IS 10245 – Heavy equipment and cranes inspection guidelines
- API 579-1 / ASME FFS-1 – Fitness-for-service assessment
- DGMS Guidelines – For mining equipment operation & certification
- OEM-specific inspection manuals – Caterpillar, Komatsu, Hitachi, Liebherr, etc.
- LOLER, OSHA, BIS, and regional transport/industrial safety authorities



### Industries We Serve

- ❖ Mining & Quarrying – Open-pit mines, surface mines, bauxite, coal, and iron ore mines
- ❖ Construction & Infrastructure Projects – Road building, tunnelling, heavy civil works
- ❖ Ports & Logistics Yards – Crane-mounted trailers, stack



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