

**O & M
OF
220 KV
SUB-STATIONS**

SUB-STATION

```
graph TD; A[SUB-STATION] --- B[SWITCH YARD]; A --- C[CONTROL & RELAY PANELS / CIRCUITS]; A --- D[AUXILLARIES]
```

SWITCH YARD

CONTROL & RELAY
PANELS / CIRCUITS

AUXILLARIES

SWITCH YARD

- TRANSFORMER
- CIRCUIT BREAKER
- CURRENT TRANSFORMER
- CAPACITIVE VOLTAGE TRANSFORMER
- LIGHTNING ARRESTER
- ISOLATOR
- WAVE TRAP
- BUS BAR & JUMPERS
- STRUCTURES

TRANSFORMER

- BUSHINGS
- MAIN TANK, INCLUDING PROTECTIVE DEVICES
- TAP CHANGER
- COOLING SYSTEM
- MARSHALLING BOX
- WHEELS LOCKING
- EARTHING
- RTCC

BUSHINGS

- OIL LEVEL OF BUSHINGS / LEAKAGE
- CLEANLINESS & FREE FROM CRACKS, CHIPS & GRIME ETC
- PERFECTNESS FOR CONNECTIONS
- PROPER DISTANCE OF ROD GAP ARRESTORS
- PROPER EARTHING OF CONDENSOR UNIT
- TIGHTNESS OF BUSHING, TERRETS, TERRET CTs ETC

MAIN TANK, INCLUDING PROTECTIVE DEVICES

- OIL LEVEL / LEAKAGE
- PROPER TIGHTENING OF TANK COVER / BELL / PIPINGS / WHEELS / CONSERVATOR ETC
- PROPER MOUNTING OF PRV / SPR / BUCHHOLZ RELAY / WTI CT CHAMBERS / OTI OIL POCKETS / MOG / AIR CELL ETC
- PROPER INCLINATION OF AUXILLARY PIPING & MAIN PIPE
- PROPER WORKING OF THERMOSYPHON

TAP CHANGER

- OIL LEVEL / LEAKAGE
- MOUNTING OF OLTC CONSERVATOR
- WORKING OF OIL SURGE RELAY
- PROPER WORKING OF OLTC MECHANISM
- ELECTRICAL & MANUAL OPERATIONS OF TAP CHANGER

COOLING SYSTEM

- LEAK FREE RADIATORS / HEADERS / PUMPS ETC
- THERMAL BEHAVIOUR OF RADIATORS
- PROPER FUNCTIONING OF PUMPS / COOLING FANS
- BEHAVIOUR OF FLOW METER
- FIRMNESS OF SUPPORTING STRUCTURE FOR VIBRATION FREE OPERATION OF COOLING SYSTEM

MARSHALLING BOX

- PROPER FUNCTIONING OF OTI & WTIs
- PROPER WORKING OF COOLING FAN STARTERS, CONTACTORS, OVERLOAD RELAYS, SINGLE PHASE PREVENTERS
- PROPER FUNCTIONING OF SWITCHES, FUSE, LINKS
- KINK LESS / DAMAGE FREE CAPILLIARY TUBES
- VERMAIN PROOF CUBICLE
- PROPER CABLING & WIRING

EARTHING

- PROPER EARTHING OF ALL NEUTRALS
- PROPER EARTHING OF TANK BODY, SUPPORTING STRUCTURES, COOLING FANS, MARSHALLING BOX, OLTC, RTCC ETC

RTCC

- PROPER WORKING OF OTI & WTI REPEATERS
- PROPER WORKING OF TPI
- PROPER WORKING OF ALARMS & INDICATIONS
- PROPER WORKING OF COOLING SYSTEM & TAP CHANGER FROM REMOTE
- PARALLEL OPERATION, IF PROVIDED
- AVR, IF REQUIRED / FUNCTIONAL

ROUTINE TESTS

- MEASUREMENT OF IR - AC / PI
- MEGNATISING CURRENT
- MEGNATIC BALANCE
- TURN RATIO / VOLTAGE RATIO
- WINDING RESISTANCE
- SHORT CIRCUIT TEST
- TERRET CT / WTI CT RATIO
- DC LOGIC TEST
- BDV OF OIL
- EARTH RESISTANCE

SPECIAL TEST

- OIL
 - DGA OF INSULATING OIL
 - MOISTURE CONTENT
 - INTERFACIAL TENSION
 - TAN DELTA
 - RESISTIVITY
- THERMAL BEHAVIOUR OF TANK & BUSHINGS
- CAPACITANCE & TAN DELTA MEASUREMENT OF BUSHINGS AND WINDINGS

LIFE ASSESSMENT TESTS

- FRA
- RVM
- FURAN / FURFURAL (FFA) ANALYSIS
- PARTIAL DISCHARGE METHOD
- THERMOVISION
- BUCHHOLZ GAS ANALYSIS
- DOMINO

CIRCUIT BREAKERS

- CHECK MEDIUM OF EXTINGUISHING CHAMBER FOR LEAKAGE & REQUIRED PRESSURE / LEVEL – OIL / GAS / AIR
- MEASURE CONTACT RESISTANCE TO ENSURE HEALTHINESS OF CONTACTS
- CHECK TIMINGS FOR PERFECT OPERATION
C – O – CO
- AVOID SLUGISH / DELAYED OPERATIONS
- ENSURE PERFECTNESS OF AUXILIARY CONTACTS AND INTERLOCKS
- ENSURE DUTY CYCLE OF CB

- CHECK CLAMPS / CONNECTORS
- PERFORM DC LOGIC TEST
- INSULATION RESISTANCE MEASUREMENT
 - MAIN CB
 - AUXILIARY WIRING
- MEASUREMENT OF EARTH RESISTANCE
- SPECIAL TESTS LIKE MEASUREMENT OF (WITH CB ANALYSER) -
 - WIPE / TRAVEL / OVERTRAVEL / BOUNCES
 - VELOCITY
 - OPERATING TIMINGS OF AUXILIARY CONTACTS
 - AMPERES TAKEN BY CLOSING / OPENING COILS
- DEW POINT MEASUREMENT (OF GAS) *

- FOR MOCBS & BOCBS
 - OIL LEVEL / LEAKAGES
 - BDV OF OIL
 - SILICA GEL
 - AIR VENT / VALVE
 - MEASUREMENT OF TRAVEL 'H'
 - RESIDUE & SLUDGE
 - CONDITION OF GASKETS

OPERATING MECHANISM

- OPERATION OF SPRING CHARGING MOTOR
- WORKING OF COMPRESSOR AND ITS MOTOR
- FUNCTIONING / CALIBRATION OF PRESSURE SWITCHES / LIMIT SWITCHES / INTERLOCKS
- EMERGENCY TRIP
- VERMAIN PROOFING
- FIRMNESS / TIGHTNESS
- LUBRICATION - OIL, GREASE
- WORKING OF DAMPING DEVICES

CURRENT TRANSFORMERS

- CHECK FOR OIL LEVEL AND LEAKAGES
- TIGHTNESS OF PRIMARY & SECONDARY TERMINALS
- PERFORMANCE OF BELLOW / DIAPHRAGM / VENT PLUG
- PRESENCE OF NITROGEN
- CONDITION OF INSULATORS (Main & Auxiliary)
- CRACKS IN GASKETS
- CLAMPS AND CONNECTORS

- BDV OF OIL
- INSULATION RESISTANCE
(KEEP A TRACK RECORD)
- RATIO TEST
- EARTHING
- **CAUTION** : **ENSURE THAT**
 - **CT (LIVE) TANK HAS NOT BECOME ,
AFTER REPAIRS , A CONDUCTOR**
 - **UNUSED CORES ARE SHORT CIECUITED**
 - **SECONDARY CIRCUITS ARE NOT OPEN CKTD**
 - **BALANCE LOADING OF SECONDARY CIRCUITS**

POTENTIAL TRANSFORMER

- OIL LEVEL AND LEAKAGE
- PRIMARY AND SECONDARY TERMINALS
- GASKETS FOR CRACKS
- CLAMPS AND CONNECTORS
- VOLTAGE RATIO
- BALANCED LOADING OF SECONDARY CKTS
- BDV OF OIL
- CHECK BURDEN ON SECONDARY CIRCUITS
- EARTHING

CAPACITIVE VOLTAGE TRANSFORMER

- OIL LEVEL AND LEAKAGE
- PRIMARY AND SECONDARY TERMINALS
- GASKETS FOR CRACKS
- HARDWARES
- VOLTAGE RATIO
- BALANCED LOADING OF SECONDARY CKTS
- BDV OF OIL
- MEASUREMENT OF CAPACITANCE AND TAN DELTA
- HF TERMINAL
- CHECK BURDEN ON SECONDARY CIRCUITS

WAVE TRAP

- **HARD WARES**

(NO MAJOR MAINTENANCE IS REQUIRED)

LIGHTNING ARRESTER

- EARTHING
- CLAMPS AND CONNECTORS
- SURGE COUNTER
- ENSURE FLOW OF LEAKAGE CURRENT
- COMPARATIVE STUDY OF IR

ISOLATORS

- ALIGNMENT OF FIXED AND MOVING CONTACTS / JAWS
- CONTACT RESISTANCE
- MECHANICAL AND ELECTRIC INTERLOCKS
- EARTH BLADES
- SMOOTH OPERATION OF MOVING PARTS
- CLAMPS AND CONNECTORS
- EARTHING

ISOLATOR MOM

- HEALTHINESS OF GEARS / WHEELS / SHAFT
- OPERATION OF LIMIT SWITCHES
- WORKING AND ALIGNMENT OF AUXILIARY CONTACTS
- MOTOR
- CONTACTOR AND OVERLOAD RELAY
- OILING AND GREASING
- EARTHING

BUS BAR , SCREEN WIRE , HARDWARES & JUMPERS

- PROPER COVERAGE BY SCREEN WIRE
- DAMAGE TO HARDWARE , CLAMPS ,
CONNECTORS , SPACERS
- TOO LONG JUMPERS BE PROPERLY
SUPPORTED
- BI METALLIC EFFECT
- BINDING WIRE
- KINKS AND DAMAGED BUS BAR / JUMPERS

STRUCTURES

- PROPER TIGHTNESS
- MISSING MEMBERS
- EARTHING
- NESTS

CONTROL & RELAY PANELS / CIRCUITS

- CONTROL PANELS
- RELAY PANELS
- COMBINATION OF CONTROL AND RELAY PANELS
- CONTROL CABLES
- CONTROL AND PROTECTION CIRCUITS
- TKS
- SPACE HATERS

AUXILIARIES

- LOCAL AC NET WORK
- DC NETWORK
- COMMUNICATION SYSTEM
- DG SET
- CONTROL ROOM BUILDING AND ASSOCIATED INFRASTRUCTURE
- FIRE FIGHTING EQUIPMENTS
- SUMP PUMP
- BASIC AMENITIES

**PAINTING
OF
EQUIPMENTS
AND SUPPORTING
STRUCTURES**

SAY GOOD BYE TO

- RUST
- DUST
- MOISTURE
- LOOSECONTACT
- BI METALLIC EFFECT

THANK YOU

QUESTIONS PLEASE