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E-BOOK 03 INTERMEDIATE EDITION

The Fire Pump House Manual

Installation, Operation & Inspection of Main, Jockey and Diesel Pumps



FIG 03.1 — FIRE PUMP ROOM HEADER, MAIN / DIESEL & JOCKEY ASSEMBLY

SYLLABUS
10 Structured Chapters

CALCULATIONS
Worked SI Examples & Tables

SITE READY
Forms & Hinglish Glossary

Shree Ganesh Enterprises (SGE) — AMC MEP 24x7
Fire Fighting · Fire Alarm · Electrical · Plumbing · HVAC · IBMS · AMC

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The Fire Pump House Manual

Installation, Operation & Inspection of Main, Jockey and Diesel Pumps

A field-ready manual covering civil foundations, pump selection, flooded suction piping, eccentric reducer orientation, delivery header manifolds, diesel engine auxiliaries, 3-point curve commissioning, and auditing older fire pump houses for hidden failure hazards.

Intended Audience: MEP site engineers, fire pump installers, plant operators, commissioning teams, and facility managers auditing existing pump rooms.

Engineering Notice & Standards Policy

This publication is an educational and field-reference guide prepared by **Shree Ganesh Enterprises (SGE)**. It is **not** a substitute for a stamped project design, statutory approval, or the governing text of the National Building Code of India (NBC), Bureau of Indian Standards (BIS) codes, Indian Electricity Rules / CEA Regulations, or your State/Municipal Fire Service Bye-Laws. Standards are cited at document level; always verify the **current applicable edition**, manufacturer datasheets, and local amendments before design, procurement, testing, or certification.

Worked numerical examples across this book are illustrative engineering demonstrations. All design inputs, pipe friction factors, battery deratings, and protective clearances must be re-checked for project conditions by a competent licensed professional. High-voltage electrical testing, pump-room servicing, and gaseous fire suppression operations can be fatal if undertaken without qualified personnel, written Permits-to-Work, and Lockout-Tagout (LOTO) controls.

Roman-script Hindi/Hinglish site terms are included cleanly to assist execution teams; formal English engineering terminology governs contractual and code interpretations.

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What You Will Learn

- Inspect pump-room civil drainage, inertia plinths, ventilation, and headroom prior to equipment lowering
- Build air-pocket-free flooded suction headers using flat-on-top eccentric reducers and vortex plates
- Specify every essential valve, NRV, air release, test line, and pressure relief on delivery headers
- Execute laser/dial alignment and pipe strain checks before grouting pump baseplates
- Verify diesel engine dual-battery health, 8-hour fuel day tank sizing, and cooling loops
- Run 3-point pump curve commissioning tests and inspect aging pump rooms for critical red flags

Chapter 1: Pump House Location, Civil Room and Foundations

The Heart of Fire Protection Needs a Clean Home

Every hose reel, wet riser, and sprinkler head on a 20-storey tower depends entirely on the fire pump house. Yet on many construction sites, the pump room sits in the dampest corner of a basement, cramped under drainage pipes, lacking sump dewatering, and crowded with scrap material. Fix civil readiness before a single pump arrives on a flatbed truck.

> **NOTE**
> Fire pump room dimensions, fire-rated walls, and access doors must align with National Building Code of India 2016 Part 4, NFPA 20 principles, and local Fire Service approvals. Always confirm current rules for underground vs above-ground pump-house locations.

Essential Pump Room Civil Checklist

- ☐ **Independent Fire Access:** Direct access from exterior open ground or fire staircase without passing through high-fire-load storage rooms.
- ☐ **2-Hour Fire Separation:** Masonry walls and rated fire doors separating the pump room from general electrical or basement parking areas.
- ☐ **Flooded Floor Drainage & Dewatering Sump:** Floor sloped cleanly to trench drains leading to a reliable sump pit with automatic float-controlled dewatering pumps. Never let floor flooding submerge electric pump motors.
- ☐ **Dedicated Ventilation & Exhaust:** Fresh air louvers (sized for diesel radiator combustion air plus cooling) and unobstructed insulated diesel exhaust routed safely outside—never near fresh-air intakes or escape stairs.
- ☐ **Maintenance Clearances & Lifting Beam:** Minimum 1.0 m clear walking aisle around all pumps and panels, plus overhead I-beam / chain-hoist eye above heavy split-case pump motors.
- ☐ **Emergency Battery Lighting:** Dual LED fixtures wired to an automatic battery inverter inside the pump room and near the door.

> **HINGLISH**
> Pump house = aag bujhane wale pumps ka kamra. Plinth = concrete ka uncha chabutra jis par pump rakha jata hai. Dewatering sump = kamre ka paani nikalne ka gaddha.

Chapter 2: Fire Pump Types and Main / Standby / Jockey Duty Logic

Understanding the Pump Line-Up

Standard installations combine three distinct pump roles so normal pressure leaks never slam large motors on/off while true fire flows receive instant power.

Pump Role	Driver Type	Typical Selection Logic	Stopping Mode
Jockey Pump	Electric (small kW)	~3–5% of main flow; shut-off slightly above main churn/normal static	Auto start & Auto stop
Main Fire Pump	Electric (TEFC squirrel cage)	100% design fire flow & duty head	Auto start / **Manual stop only**
Standby Fire Pump	Diesel Engine (compression ignition)	100% backup flow & head; independent of grid power	Auto start / **Manual stop only**

Where systems require separate sprinkler and hydrant headers, provide dedicated electric + diesel pairs or confirm permissible shared-header rules per governing code.

Comparing Fire Pump Casings

- **Horizontal Split-Case Pump:** Preferred heavy-duty fire pump for larger flows (e.g., 1,620 to 4,500+ lpm). Top half casing unbolts cleanly without disturbing suction/delivery flange alignments.
- **End-Suction Centrifugal Pump:** Compact, lower initial cost for smaller jockeys, terrace boosters, and moderate main duties; requires spacer coupling so motor doesn't move during seal servicing.
- **Vertical Turbine (VT) Pump:** Mandatory whenever the water source lies *below* the pump centreline (negative suction lift)—for instance deep underground sumps or open reservoirs where positive flooded suction cannot be achieved.

WARNING

Never install a standard horizontal centrifugal fire pump with suction lift (water level lower than pump eye). Trapped air locks break prime within seconds during an emergency start.

HINGLISH

Split-case pump = beech se khulne wala bada pump jiski repair bina pipe khole ho sakti hai. Negative suction = jab paani ka level pump se neeche ho (isme Vertical Turbine pump hi lagta hai).

Chapter 3: Suction Piping — Flooded Suction, Eccentric Reducers and Vortex Plates

90% of Cavitation Starts Within One Metre of the Pump Flange

Water behaves differently on the suction side of a pump than on the delivery side. While delivery piping pushes water out at 7–10 bar, suction lines pull or flow gently near atmospheric pressure. Even minor air bubbles, turbulence, or partial valve throttles inside the suction header collapse vapor bubbles violently against impeller vanes (**cavitation**), destroying brass/bronze impellers and crashing delivery head.

Non-Negotiable Suction Rules

1. **Positive Flooded Head:** Pump impeller eye must stay below the lowest possible operational water surface of the fire tank (except approved VT pumps).

2. **Vortex Plate at Tank Wall / Pit:** Fit a horizontal anti-vortex baffle plate across the tank suction bellmouth to prevent whirlpool air ingestion when tank levels fall.
3. **Straight Run Before Pump Nozzle:** Maintain at least 5x to 10x pipe diameters of straight unobstructed pipe immediately ahead of double-suction split-case pump inlets (never attach a sharp 90-degree elbow horizontally straight onto a split-case suction flange—it feeds uneven flow to the impeller halves).
4. **Eccentric Reducer Orientation — Flat Side UP:** When reducing from a larger 200 NB header down to a 150 NB pump flange, use an **eccentric reducer with the flat edge on top** (belly downward). Putting a concentric reducer or sloping upward creates a permanent trapped air bubble pocket directly before the impeller!
5. **Gate / OS&Y Valve Only — Never Globe or Butterfly Close to Impeller:** Use full-bore Rising Stem (OS&Y) gate valves locked/monitored open on suction lines. Strainers if fitted must be oversized basket strainers monitored continuously so debris cannot starve the pump.

> **HINGLISH**
> Cavitation = hawa ke bulbulon ka pump ke pankhe se takra kar dhatu ko todna. Eccentric reducer flat-on-top = oopar se seedhi reducer fitting taaki hawa na phanse.

Chapter 4: Delivery Header, NRV, Relief Valves and Flow Test Arrangement

Building a Bulletproof Discharge Header

On the high-pressure discharge side of each pump, install components in strict logical order:

1. **Flexible Connector / Spool (if specified for vibration)**
2. **Eccentric / Concentric Increaser** up to header size
3. **Non-Return Valve (NRV / Swing Check or Silent Spring Check Valve):** Stops high header pressure spinning idle pumps backwards and isolates operating pumps from standby ones.
4. **Isolation Valve (OS&Y Gate or Wafer/Lugged Butterfly with tamper switch)**
5. **Pressure Gauge with 3-way isolation cock** + **Automatic Air Release Valve** on pump casing top (essential on vertical/split-case).
6. **Casing Circulation Relief Valve (on Electric pumps):** Bleeds a small stream back to drain or tank during churn (zero hydrant flow) so trapped water inside the casing does not boil into steam.
7. **Main Pressure Relief Valve (especially on Diesel / VFD / excessive churn pressure):** Required whenever pump churn pressure plus static suction exceeds system pipe working rating.
8. **Flow Test Header & Bypass Meter Loop:** Dedicated line routed safely back into the underground fire tank equipped with an annubar/orifice/ultrasonic flowmeter and throttling gate valve so engineers can conduct full 100% and 150% pump tests without flooding the basement or parking lot!

> **FIELD TIP**
> Pipe your flow test return back below water level inside the UG fire tank (or with submerged diffuser) so re-entering high-velocity water does not aerate the tank and cause suction pump cavitation during long tests.