METEC
EXCEEDING EXPECTATION

FIRE PUMP OVERPRESSURE RISK IN FIRE PROTECTION SYSTEMS

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Executive Awareness Note for Owners, Consultants & Decision Makers

1. EXECUTIVE MESSAGE

In many Industrial, Commercial, and Infrastructure Projects, Fire pumps are selected with pressure heads significantly higher than actual hydraulic demand, often under the assumption that higher pressure provides better protection or accommodates future expansion.

While this may appear conservative, it can introduce hidden Technical, Operational, and Financial risks.

Key Industry Concerns

- Excessive fire pump head increases maximum shutoff (churn) pressure.
- International risk engineering practices may require jockey pump standby pressure above the highest fire pump shutoff pressure.
- This can force the entire fire protection system to remain continuously at elevated pressure.
- Continuous high pressure stresses sprinkler components, valves, gaskets, hose stations, fittings, and instrumentation.
- Hydrotest pressure does not justify continuous high-pressure operation.
- Oversized fire pumps increase project cost, maintenance burden, and insurance review concerns.
- Future expansion requirements can be managed through better engineering alternatives without increasing system pressure.

Industry message:

A fire pump should be selected for actual engineered demand—not arbitrary excess pressure margin.

2. THE COMMON INDUSTRY MISTAKE

A frequently observed design approach:

Actual hydraulic requirement	----	80 - 85m Head
Selected Fire Pump	----	100–120 m head

Typical justifications:

- "Higher pressure gives better safety."
- "Let us keep margin for future expansion."
- "Pipe sizing can be adjusted later."
- "Avoid redesign in future."

This appears conservative but often creates avoidable risk.

> Fire Protection Systems must be stable, reliable, and safe under worst- case conditions - NOT SIMPLY OVERSIZED

3. WHAT ACTUALLY HAPPENS IN THE SYSTEM

A fire pump does not operate only at its rated duty pressure. When flow reduces significantly or discharge is blocked, the pump pressure rises to maximum shutoff (churn) pressure.

Example:

Selected fire pump	110 m duty head
Possible shutoff pressure	Up to approximately 15 bar
If insurer requirements call for jockey pump standby pressure above this shutoff pressure	15.5 bar or higher standby pressure may be required

- This means the entire sprinkler / hydrant network remains continuously under elevated pressure.
- That creates long-term mechanical stress and increased failure risk.

Simple Comparison:

Parameter	Practical Design	Overdesigned System
Duty head	85 m	110 m
Approx. shutoff pressure	11.7 bar	15.1 bar
Jockey standby pressure	~12.2 bar	~15.6 bar
System stress	Controlled	Excessive
Reliability	Better	Reduced

The issue is not merely compliance. The issue is long-term system robustness.

4. WHY INSURERS RAISE THIS ISSUE

International risk engineering organizations evaluate worst-case fire system behaviour.

Their primary question is:

“What is the highest pressure the system may experience under abnormal or emergency conditions?”

—not simply the design duty pressure.

To avoid:

- nuisance fire pump starts
- unstable pressure cycling
- standby pressure fluctuation
- false operational conditions

Risk engineers may require:

Jockey pump shutoff pressure above the highest shutoff pressure of connected fire pumps, with safety margin.

This is sound loss prevention practice.

However, if the main fire pump has been unnecessarily oversized, this requirement pushes the entire system into continuous high-pressure operation. Thus, poor pump selection becomes a system-wide risk.

5. FUTURE EXPANSION SHOULD NOT JUSTIFY OVERPRESSURE DESIGN

Future expansion is a common reason used to justify oversized fire pumps.

Typical statements:

- "Future building expansion may need higher pressure."
- "Additional sprinkler demand may come later."
- "Let us select a bigger pump now."

This approach is technically weak.

Future expansion can usually be accommodated within the same safe pressure design envelope using better system engineering.

Better Engineering Alternatives

Sprinkler zoning / hydraulic segregation	If protected area increases: • Divide the sprinkler network into hydraulic zones • Maintain the same design pressure basis • Avoid increasing pressure across the entire facility
Open nozzle / deluge system bifurcation	For open nozzle systems, simultaneous discharge demand can artificially drive pump sizing upward. Better approach: • split hazard areas into independent operating zones • activate only the affected zone • reduce simultaneous demand • maintain practical pump pressure
Local booster pumps for elevation challenges	If future expansion involves abnormal building height or remote elevated areas: Instead of increasing pressure for the entire facility: • add local booster pumps • create dedicated pressure zones • protect only affected sections This avoids overstressing the complete fire protection network.
Planned modular expansion	Future readiness can be addressed by: • spare pump foundation • spare fire header connections • reserved electrical capacity • future riser provisions • planned pressure zoning This creates flexibility without penalizing current system safety.

Industry message:

Future expansion is a planning issue—not a justification for permanent overpressure design.

6. BUSINESS & ENGINEERING RISKS

RISK	PRACTICAL IMPACT
Overpressure exposure	Damage to sprinkler fittings, valves, hoses, gaskets
Continuous high standby pressure	Accelerated wear and leakage
Water hammer severity	Increased mechanical stress
PRV dependency	Lower reliability, more maintenance
Oversized pump procurement	Higher CAPEX
Larger electrical / diesel infrastructure	Increased project cost
Insurance review comments	Approval delays / redesign
Future retrofit corrections	Significant avoidable cost

7. IMPORTANT CLARIFICATION

A common misunderstanding: "The system passed hydrotest, therefore high operating pressure is acceptable." This is incorrect.

Hydrotest is:

- temporary
- controlled
- proof testing only

Continuous operation at elevated pressure causes:

- seal fatigue
- gasket creep
- valve stress
- instrumentation degradation
- leakage development

Testing Proves Integrity. It does not justify permanent high-pressure operation.

8. DECISION MAKER CHECKLIST

Before approving fire pump selection, ask:

✓ What is the actual hydraulic demand?
✓ Is the selected pump based on engineering calculation or assumption?
✓ What is the maximum shutoff pressure?
✓ What is the weakest pressure-rated system component?
✓ What jockey standby pressure will be required?
✓ Is future expansion real or speculative?
✓ Can zoning / booster / modular expansion solve future needs?
✓ Are PRVs being used to compensate for oversized pump selection?

If these questions are not clearly answered, design risk remains.

FINAL INDUSTRY MESSAGE

The safest fire protection system is not the one with the highest pressure pump. It is the one with the correctly engineered pump.

Unnecessary overdesign creates:

- Hidden Operational Risk
- Avoidable Capital Cost
- Insurer Concerns
- Maintenance Burden
- Reduced Reliability

RIGHT SIZING IS BETTER ENGINEERING THAN OVERSIZING.