Grundfos fire pumps solution

- Peerless FM/UL pumpset
- NFPA 20
- Grundfos NK range
- Compliance to SS 575 and AS 2941



Grundfos Indianapolis – Peerless Pump Company

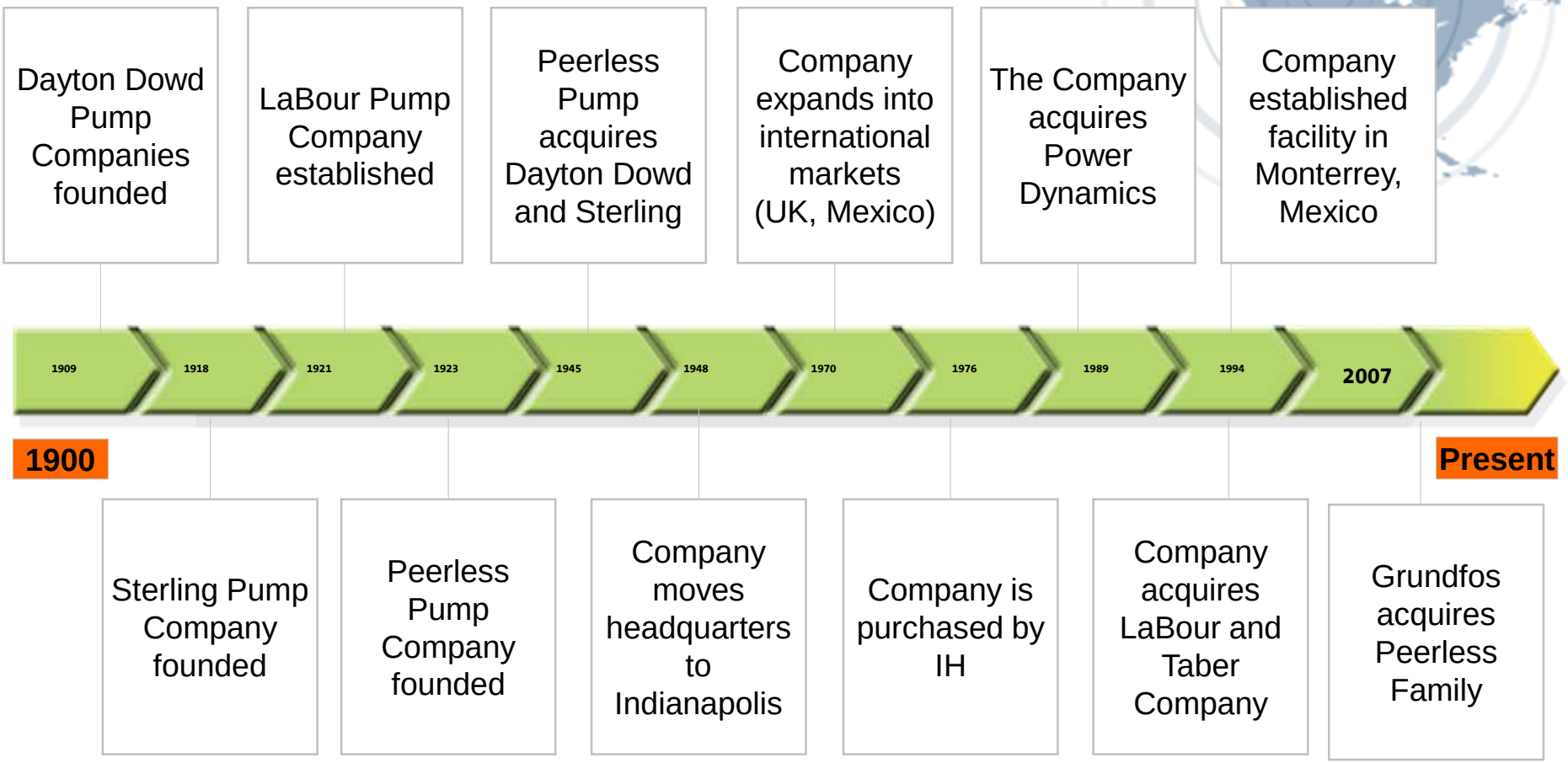
NFPA20 / FM approved / UL Listed Fire Pumps



Where Is Indianapolis, IN?



COMPANY HISTORY



PPU Facilities



Indianapolis, Indiana
Headquarters



Brookshire, Texas
Peerless Engineered Systems



Lubbock, Texas
Quick Response Center (QRC)



Selma, Alabama
LaBour Taber

Facilities Detail – Indianapolis

Company Headquarters
Standard Product Production Hub
QRC and Testing Center

Size

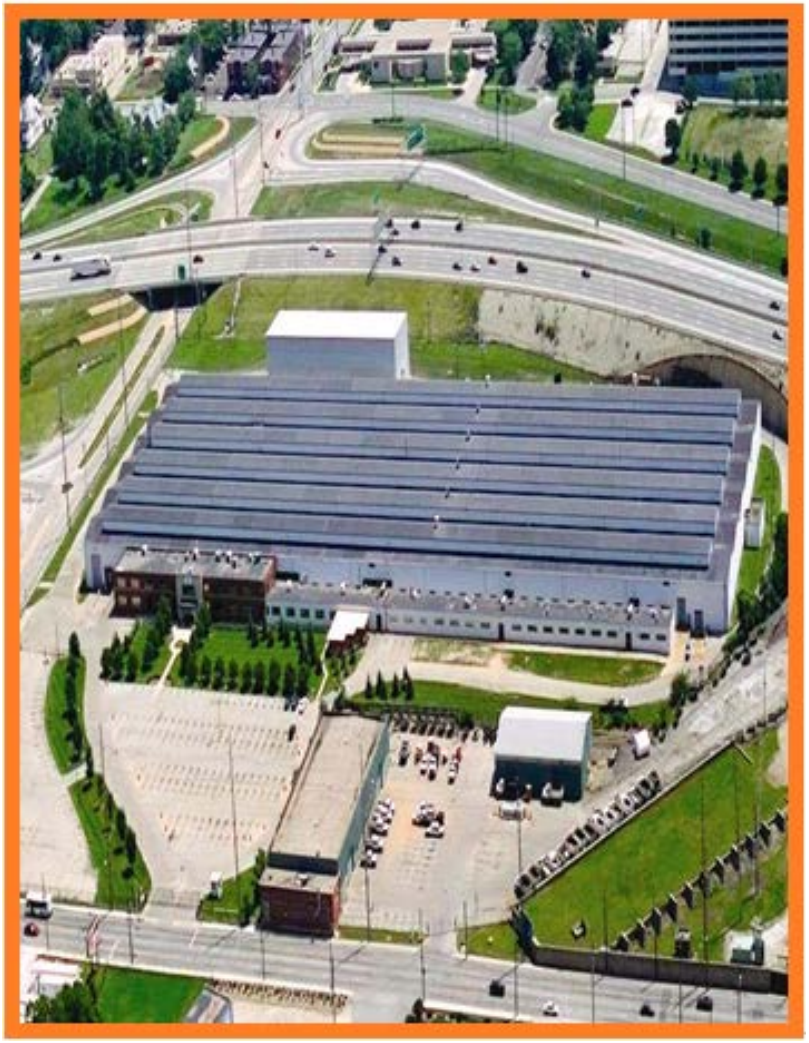
- 300,000 sq. feet

Functions

- Design, Manufacturing and assembly
- Testing (up to 150,000 GPM)
- Sales & Administration

Certification

- ISO 9001 Quality Certified
- ISO 14001 Environmental Certified
- OHSAS 18001 Safety Certified
- CE, ATEX
- UL/FM Test Lab



Applications: On-Shore Fire Protection







Primary Product Offerings

Horizontal Split-Case Pump



Vertical In-Line Pump





Vertical Turbine Pump



Diesel Engine-Driven Pump System



Electric Motor-Driven Pump System

Key Decision Drivers

1. Key relationships with contractors
2. Technical know-how
3. Responsiveness to customer
4. Range of listed products

Trusted

Peerless Pumps also provide support to mission critical operations. Failure is not an option



Argonne National Laboratories

Miami International Airport





U.S. Embassy – Dar Es Salaam, Tanzania

Exelon Nuclear Facility



Royal Palace – Amman, Jordan



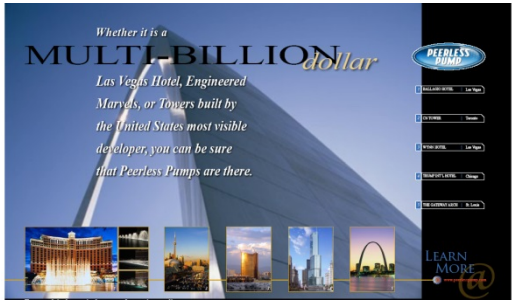
Bali Ngurah Rai Int. Airport

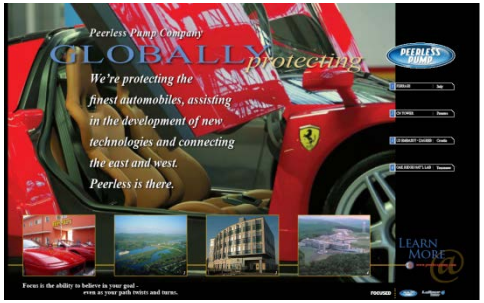


High Profile

Peerless pumps have been selected for their performance and reliability to protect many of the world's most important buildings



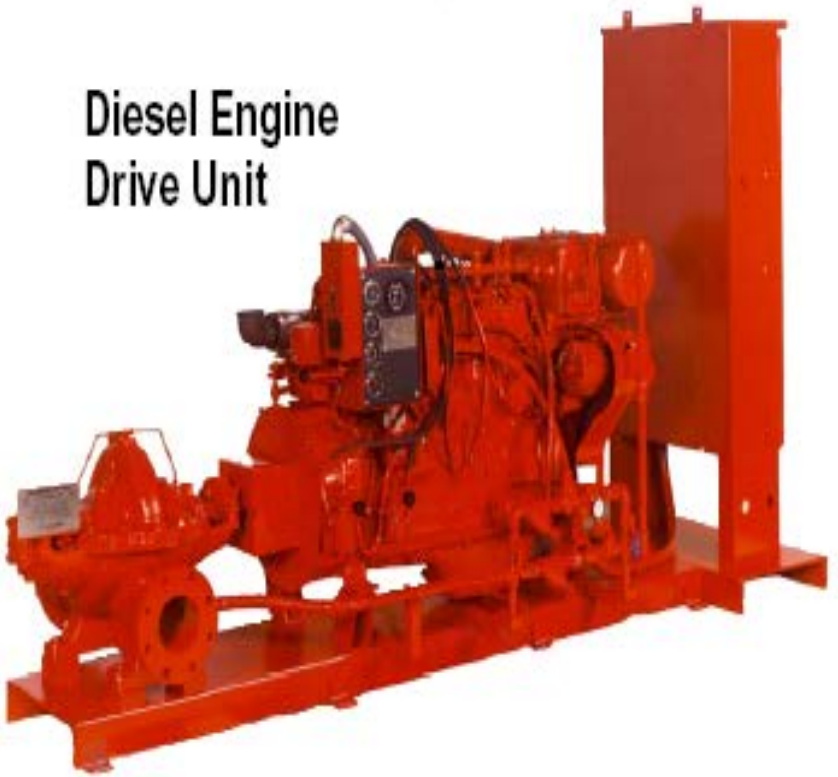




- Peerless Fire Protection Pumps protect some of the world's tallest buildings:
  - – Taipei 101 (2003)
  - – Sears Tower (1973)
  - – Jin Mao Tower (1999)
- They also protect countless other landmarks:
  - - Empire State Building
  - - CN Tower
  - - Trump Tower
  - - No. 7 World Trade Center
  - - St. Louis Gateway Arch
  - - Bellagio and Wynn Hotels
  - - US Walmart

Fire Pump Units & Packaged Systems





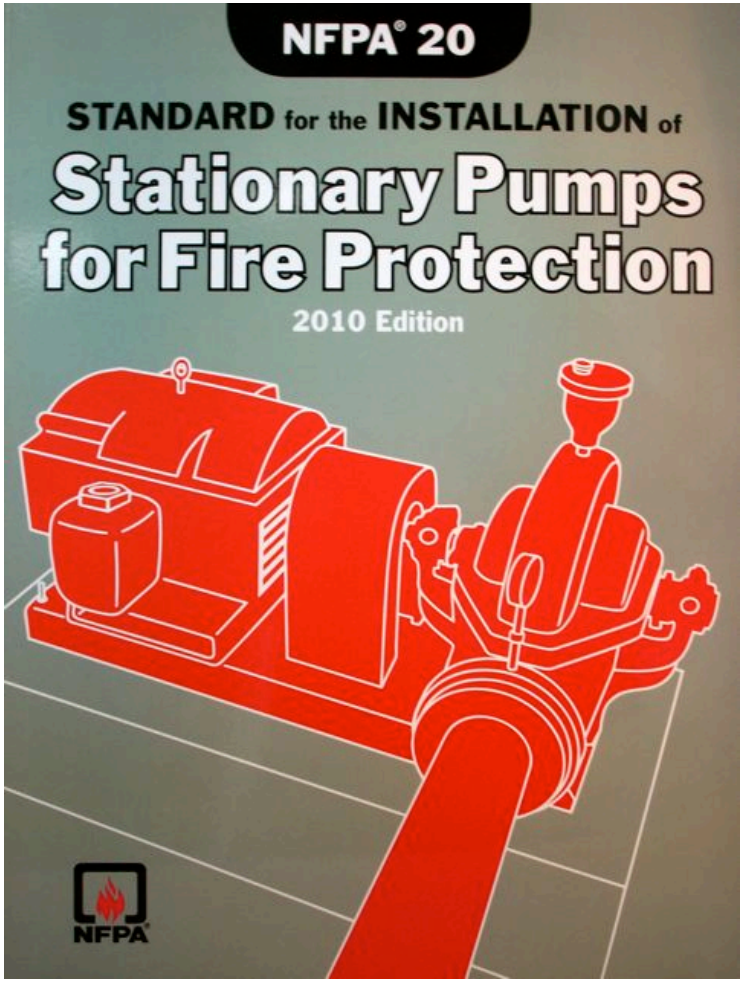
FM Approved Pumps?

UL Listed Pumps?

NFPA20?

What Makes a Fire Pump?

- ***Laws, Regulations, Standard & Requirements of a country.***
- ***Insurance Company requirements.***
- ***Owner and consultant preferences.***


NFPA® 20
STANDARD for the INSTALLATION of
Stationary Pumps for Fire Protection
2010 Edition
NFPA

(Standard continued)

NFPA 20

Origin and Development of NFPA 20

The first National Fire Protection Association standard for automatic sprinklers was published in 1896 and contained paragraphs on steam and rotary fire pumps.

The Committee on Fire Pumps was organized in 1899 with five members from underwriter associations. Modern committee membership has included representatives of Underwriters Laboratories of both the United States and Canada, Insurance Services Office, Factory Mutual, Industrial Risk Insurers, national trade associations, state governments, engineering organizations, and private individuals.



Early fire pumps were only secondary supplies for sprinklers, standpipes, and hydrants and were started manually. Today, fire pumps have greatly increased in number and in applications — many are the major or only water supply, and almost all are started automatically. Early pumps usually took suction by lift from standing or flowing water supplies because the famed National Standard Steam Fire Pump and rotary types suited that service. Ascendancy of the centrifugal pump resulted in positive head supply to horizontal shaft pumps from public water supplies and aboveground tanks. Later, vertical shaft turbine–type pumps were lowered into wells or into wet pits supplied from ponds or other belowground sources of water.

Gasoline engine–driven pumps first appeared in this standard in 1913. From an early status of relative unreliability and of supplementary use only, first spark-ignited gasoline engines and then compression ignition diesels have steadily developed engine-driven pumps to a place alongside electric-driven units for total reliability.

Fire protection now calls for larger pumps, higher pressures, and more varied units for a wide range of systems protecting both life and property. Hydraulically calculated and designed sprinkler and special fire protection systems have changed concepts of water supply completely.

NFPA®

NFPA 20





Committee Membership Classifications

The following classifications apply to Technical Committee members and represent their principal interest in the activity of the committee.



M — *Manufacturer:* A representative of a maker or marketer of a product, assembly, or system, or portion thereof, that is affected by the standard.

U — *User:* A representative of an entity that is subject to the provisions of the standard or that voluntarily uses the standard.



I/M — *Installer/Maintainer:* A representative of an entity that is in the business of installing or maintaining a product, assembly, or system affected by the standard.

L — *Labor:* A labor representative or employee concerned with safety in the workplace.

R/T — *Applied Research/Testing Laboratory:* A representative of an independent testing laboratory or independent applied research organization that promulgates and/or enforces standards.

E — *Enforcing Authority:* A representative of an agency or an organization that promulgates and/or enforces standards.

I — *Insurance:* A representative of an insurance company, broker, agent, bureau, or inspection agency.

C — *Consumer:* A person who is, or represents, the ultimate purchaser of a product, system, or service affected by the standard, but who is not included in the *User* classification.



SE — *Special Expert:* A person not representing any of the previous classifications, but who has a special expertise in the scope of the standard or portion thereof.

NOTES;
1. "Standard" connotes code, standard, recommended practice, or guide.
2. A representative includes an employee.
3. While these classifications will be used by the Standards Council to achieve a balance for Technical Committees, the Standards Council may determine that new classifications of members or unique interests need representation in order to foster the best possible committee deliberations on any project. In this connection, the Standards Council may make appointments as it deems appropriate in the public interest, such as the classification of "Utilities" in the National Electrical Code Committee.
4. Representatives of subsidiaries of any group are generally considered to have the same classification as the parent organization.

NFPA®

What does NFPA20 cover?

Purpose:

The purpose of the this standard is to provide a reasonably degree of protection for life and property from fire through installation requirements for stationary pumps for fire protection based upon sound engineering principals, test data, and field experience.
(Clause 1.2)

NFPA does not approve, inspect, or certify any installation, procedures, equipment, or material.....

Who does?

- FM, UL, ULC

What does NFPA20 cover?

14 sub-chapters – Covering the scopes of liquid supplies; suction, discharge, and auxiliary equipment; power supplies; electric drive; diesel engine drive; steam turbine drive; controls; acceptance test and operation.

- General Requirements in Pump Room
- Fire pumps for High-Rise Buildings
- Centrifugal Pumps
- Vertical Shaft Turbines-Type Pumps
- Positive Displacement Pumps
- Electric Drive for Pumps
- Electric Drive Controllers and Accessories
- Diesel Engine Drive
- Engine Drive Controllers
- Steam Turbine Drive
- Acceptance Testing, Performance, and Maintenance

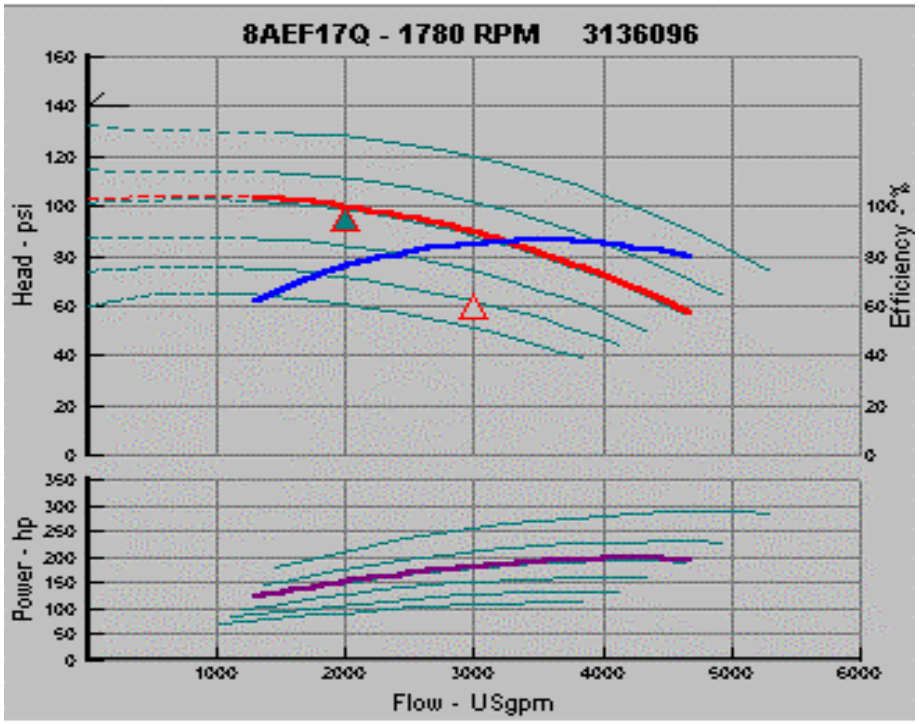
NFPA 20 Highlights

General guidelines.

- 1) A single entity must have unit responsibility.
- 2) AHJ - Authority Having Jurisdiction. Fire Marshal, Insurance inspector, Self insured.
- 3) Defines the fire pump hydraulic performance.
- 4) Ratings / Sizes of pumps (Set GPM's).

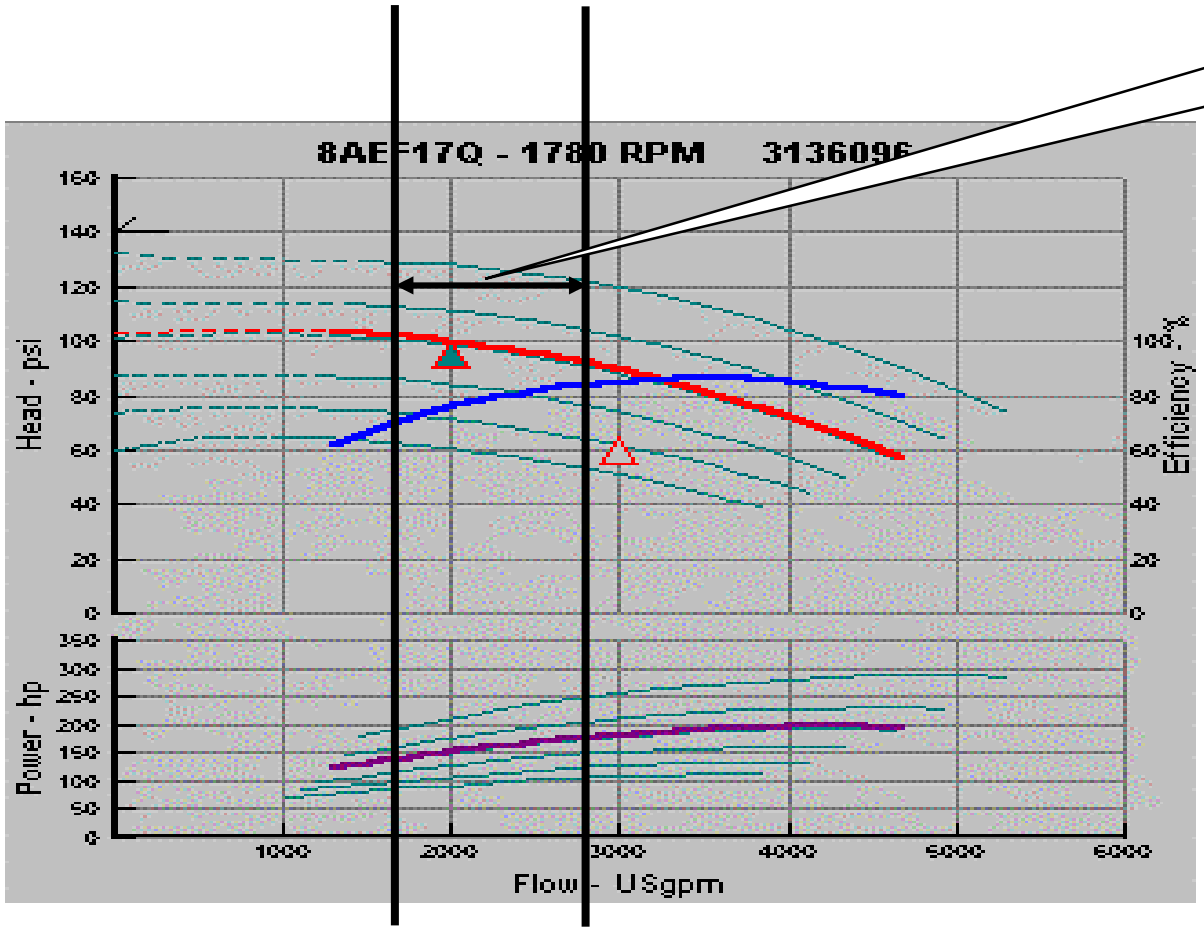
Rated or listed flow

25,50,100,150,200,….500….2000….5000GPM Table 5.25(a) NFPA 20



- Rated flow: 100% Flow at 100% Head.
- Maximum of 140% of Head at Shutoff.
- Minimum of 65% of Head at 150% of Flow.

Customer design flow (operating):



Recommended operating point

- To avoid
  - Suction issue
  - Vibration
  - Heating
  - Cavitation
  - Bearing failure

NFPA 20 Highlights

- 5) Testing
- 6) Circulation relief valve on electric to prevent overheating .
- 7) Main relief valve on diesels and variable speed.
- 8) No static suction lift.
- 9) Vertical Turbine.
  - If there is a static suction lift.

NFPA 20 Highlights

- 10) Listed motors .
  - a) NEMA design, in Europe FM allows IEC IP 55 motor
  - b) Motor sized for pump peak horsepower anywhere on curve.

- 11) Listed Engines.
  - a) Deductions for temperature and altitude.
  - b) Dual battery starting set.
  - c) Panel start cycles. 15 second crank, 15 second rest, 3 minutes.
  - d) Panel starts engine once per week for 30 minutes. Electric 10 minutes (NFPA 25)
  - e) Fuel tank capacities. 1 gal per hp. plus 5% sump and + 5% expansion.

- 12) Listed Controllers
  - High standard of withstanding rating, controls and recording features, etc.

How can you make sure the equipment supplied is fully compliant with NFPA 20?

- The equipment needs to be listed or approved by an independent 3rd party organization.
- FM and UL are the ones approving and listing fire equipment according to NFPA 20 guidelines
- They make sure that the equipment is fully compliant at minimum with NFPA 20 guidelines
- They also have their own specificities on top of NFPA 20: packing, special material, suction test ...

How to Ensure that the Fire Equipment is fully Compliant with NFPA-20?

APPROVALS

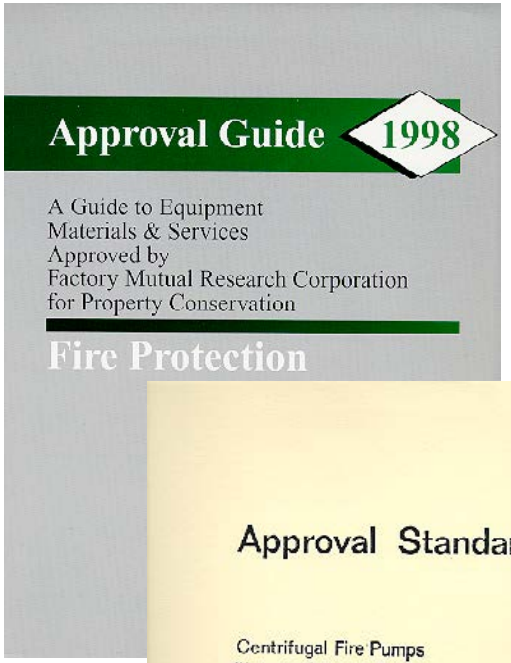
FM
(Factory Mutual)

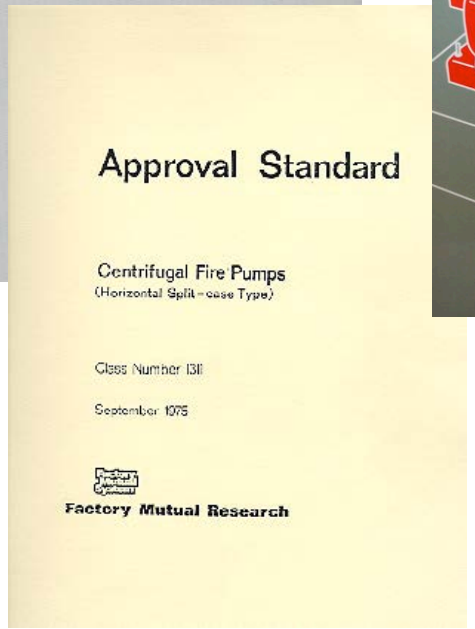
UL
(Underwriters Laboratories)

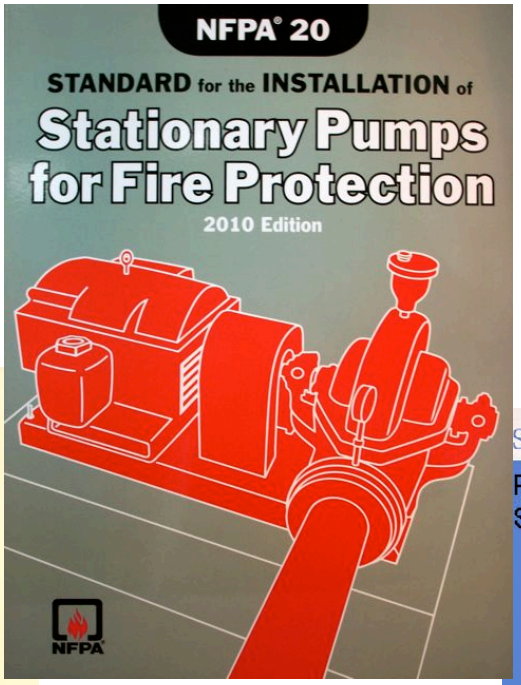
LISTED

ULC
(UL of Canada)

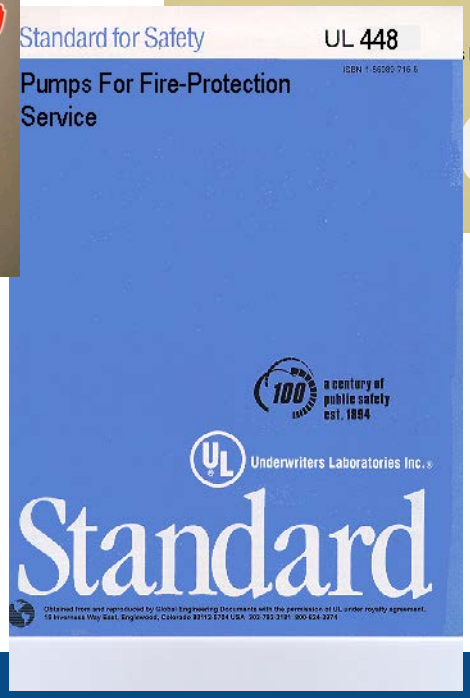
LISTED


Approval Guide 1998
A Guide to Equipment
Materials & Services
Approved by
Factory Mutual Research Corporation
for Property Conservation
Fire Protection


Approval Standard
Centrifugal Fire Pumps
(Horizontal Split-case Type)
Class Number 1311
September 1975
Factory Mutual Research


NFPA® 20
STANDARD for the INSTALLATION of
Stationary Pumps
for Fire Protection
2010 Edition
NFPA


Price U.S. $14.00
Fire Protection Equipment
1998
Contains
Listings and Classifications
in effect as of December 12, 1997
Please read information contained
in paragraph 2 on page iv
Laboratories Inc.®
ory


Standard for Safety
UL 448
Pumps For Fire-Protection
Service
a century of
public safety
est. 1894
Underwriters Laboratories Inc.®
Standard

Unit Responsibility

NFPA-20 – Paragraph A4.4.1
"A single entity shall be designated as having **unit responsibility** for the pump, drive" and controller."
FM 3-7N – Paragraph 1-6 from FM Global Property Loss Prevention
« The pump manufacturer shall be responsible for: 1) furnishing the complete unit consisting of pump, driver, controller, transfer switch equipment and all necessary accessories; 2) ensuring proper installation and performance during pumps acceptance test; 3) resolving all problems that may arise during installation and/or acceptance tests. Any sale or transfer of design, packaging or delivery of the unit does not relieve the pump manufacturer of its responsibility. If a pump physically leaves the manufacturer's facility with the FM approval mark, it is implicit that any third party receiving the unit is an authorized representative of the pump manufacturer, and the pump manufacturer and the authorized representative shall assume the responsibilities described above ».

Fire pump “packagers”

FM 1311 and 1312

In the event that an Approved pump manufacturer chooses to have another company package their pumps as FM Approved, that company should be audited and receive an Approval certification from FM for packaging the pump with the driver, controller and other accessories. This is what is meant by the “Authorized Representative” in the pump standards.

What is the difference between a “as per NFPA 20” fire pump set, and a “NFPA 20 FM approved” pump set?

- As per NFPA 20: free interpretation, no guarantee on compliance and quality, not tested, risky

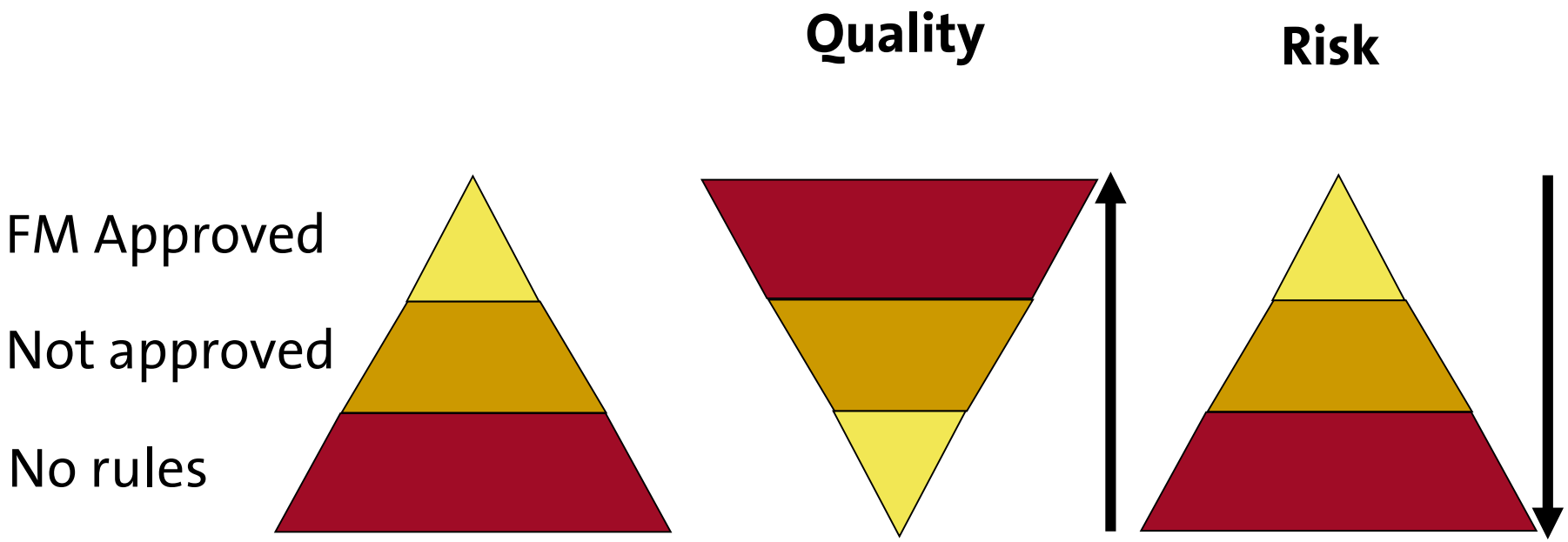
- NFPA 20 FM Approved: fully compliant, tested, approved, quality, guaranteed







The higher the quality, the lower the risk!



Raise the standards, lower the risk!

- The question is:
  - In case of a fire; who is responsible for property damage or loss; or worst injury or death?

The Singapore Local Updated Fire Protection Solutions and Practices



CAE SINCE 1988









C A E ENGINEERING PTE LTD

Introduction to the
Singapore Standard
SS575:2012
(FORMERLY CP29)
OR
CP52 : 2004



List of Regulated Fire Safety Products & Mat

Product	Acceptable Standard		
1. Fire Alarm Panel	1.EN 54 Pt 2 & 4 2.CP10		
2. Fire Pump	1.AS 2941, UL, FM, BRE	1A (Labels issued)	AS - Annual witness testing; FM/UL/BRE-Annual; Submission of reports shall include surveillance inspection & witness testing.

UL/FM FIRE PUMPSET



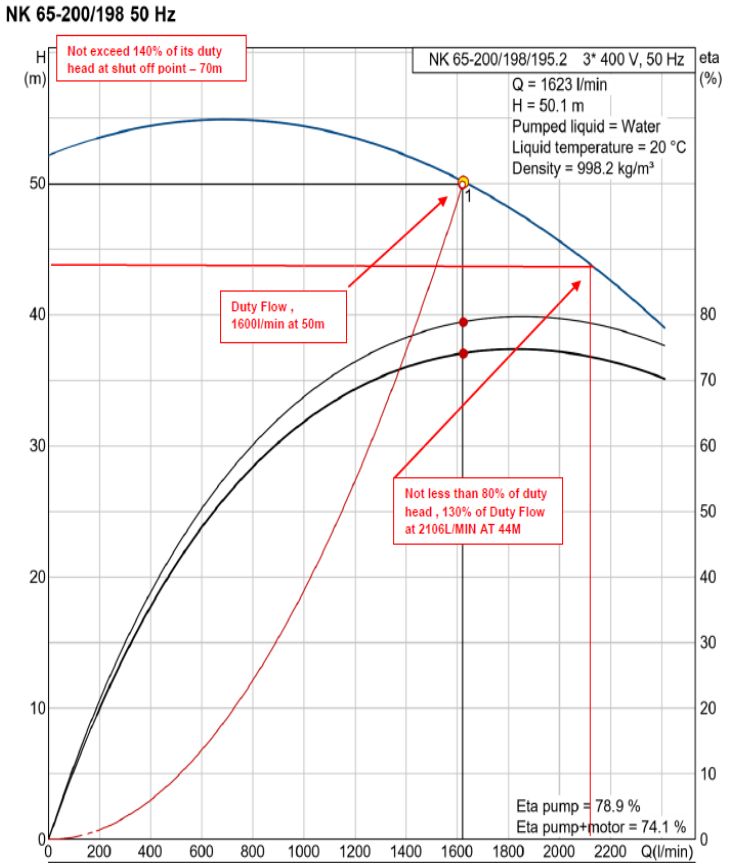
AS2941 FIRE PUMPSET



Comparison of NFPA 20 vs AS 2941

	NFPA20 , UL LISTED , FM APPROVED , PSB/SETSCO LISTED PUMPSET	AS2941 , PSB/SETSCO LISTED PUMPSET
1	LISTING IN Q AND H + MODEL	LISTING IN MODEL
2	TEST AND LIST BY INDIVIDUAL VENDOR, THEN ASSEMBLY BY PUMP MANUFACTURER	TEST AS A COMPLETE ASSEMBLY
3	DUTY POINT (CAN BE 90-140% OF RATED FLOW)	DUTY POINT ONLY
4	MIN OF 65% OF HEAD AT 150% FLOW	MIN. 80% OF DUTY HEAD AT 130% FLOW
5	MAXIMUM OF 140% OF HEAD AT SHUT OFF	MAXIMUM OF 140% OF HEAD AT SHUT OFF
6	NEMA FRAME, SF OF 1.15	IEC FRAME, SF OF AT LEAST 1.15
7	ODP, NEMA 2	TEFC , IP55
8	DIESEL TANK IS SIZE BASED ON 1GAL PER HORSEPOWER	DIESEL TANK IS SIZE BASED ON 6HRS OF CONSUMPTION
9	STANDARD ON DATA LOGGER	OPTION FOR DATA LOGGER
10	CONTROLLER BUILT WITH EMERGENCY START MECHANISM - DOL STARTING (600-800% OF FLA)	CONTROLLER NOT BUILT WITH EMERGENCY START MECHANISM
11	NO REQUIREMENT ON MONITOR BATTERY C/W CHARGER SHALL BE PROVIDED TO MAINTAIN THE MONITORING AND ALARM FUNCTION OF THE ELECTRIC CONTROLLER	MONITOR BATTERY C/W CHARGER SHALL BE PROVIDED TO MAINTAIN THE MONITORING AND ALARM FUNCTION OF THE ELECTRIC CONTROLLER FOR 72HRS

Compliance to the Singapore Standard SS575 –
Code of practice for fire hydrant, rising mains and hose reel systems



- 1.4.15 Fire pumpset

An assembly comprising **a pump, a driver, a coupling and ancillary components on a common base** together with an **integral or separate fire pump controller, and listed by a recognized institution**.

- 5.1.3 Fire pumpsets

The performance characteristics of pumpsets shall be capable of providing **maximum flow (130 % of duty flow) at not less than 80 % of duty head, and shall not exceed 140 %** of its duty head at shut off point.



CERTIFICATE OF CONFORMITY

This Certificate is issued to

CAE PUMPS AND EQUIPMENT PTE LTD
No. 1 Yishun Street 23
#01-45 YS-One
Singapore 768441

For Product Certification Scheme: Class 1

Product	:	**Fire Pumpset**
Brand	:	**GRUNDFOS**
Model	:	**NK Series**
Country of Origin	:	**Denmark**
Product Details	:	**Comprising pump, driver and controller Refer to appendix for details.**

which has complied with the requirements of the scheme based on the following:

STANDARD(S)	TEST REPORT(S)	
AS 2941: 2008	FN00104-13	FN00110-14
AS 2417: 2001	FN00010-13	FN00016-14
	FN00147-14	FN00101-13
	FN00035-12	FN00018-14
	FN00187-14	FN00117-14
	FN00084-13	FN00121/23/25-11
	FN00118-14	FN00023/24-15
	FN00119-14	FN00207-14
	FN00026-14	FN00096-14
	FN00009-15	FN00150-13

Sze Thiam Siong (Mr)
General Manager
SETSCO Services Pte Ltd
18 Teban Gardens Crescent
Singapore 608925

Certificate No	*Date of Issue*	*Date of Expiry*
FSP-2015-0260	*31/08/2015*	*30/08/2018*

SETSCO

This Certificate is part of full report and should be read in conjunction with it. This Certificate remains the property of SETSCO Services Pte Ltd (SETSCO) and shall be returned upon request. The use of this Certificate is subjected to the terms and conditions of the SETSCO Product Certification Scheme. The manufacturer is solely responsible for the compliance of any product that has the same designation as the product type-tested. Persons relying on this Certificate should verify its validity by checking SETSCO website at www.setsco.com.

Grundfos Pump Testing & Certificates

- Witness performance test in Grundfos Test Bed
- ➢ To prove the tested flow rate, total head, pump efficiency and shaft power of a pump is satisfactory under ISO 9906.

- **NK Testbed** - End-suction Test Bed is a specially designed productions tester for Q/H test of pump models ranging from End-Suction (Single Stage) pumps (DN32 -> DN300). It is able to facilitate Testing of Flow up to 2000m³/h and Total Differential Head up to 20 Bar.

- **GIGA Test Bed** – GIGA Test bed is a specially designed production tester for Q/H test of Horizontal Split-case and End-Suction pumps (DN50 -> DN500). One of the largest test bed in Grundfos and it is able to facilitate testing of flow up to 4000m³/h and total differential head up to 20 Bar.


Certificate SG16/05390

SGS

The management system of

GRUNDFOS (Singapore) Pte Ltd

25 Jalan Tukang
Singapore 619264

has been assessed and certified as meeting the requirements of

ISO 9001:2008

For the following activities

Assembly, Servicing, Sales and Distribution of Grundfos Pumps

Further clarifications regarding the scope of this certificate and the applicability of ISO 9001:2008 requirements may be obtained by consulting the organisation

This certificate is valid from 02 May 2016 until 15 September 2018 and remains valid subject to satisfactory surveillance audits.
Re certification audit due before 15 July 2018
Issue 1. Certified since 02 January 2001

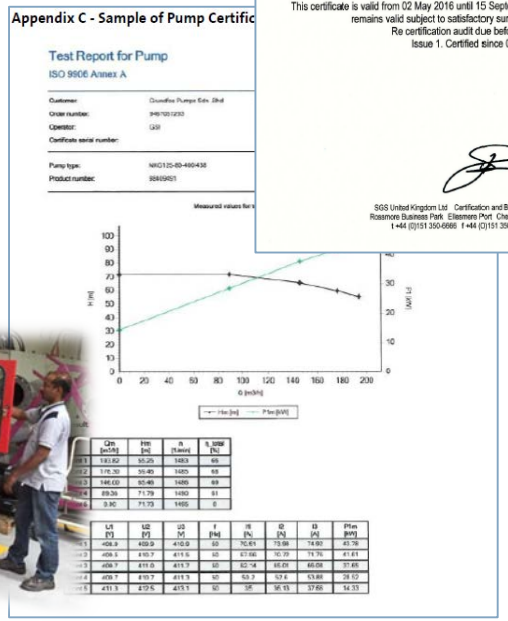
Authorised by

SGS United Kingdom Ltd Certification and Business Enhancement
Rossmore Business Park Ellesmere Port Cheshire CH65 3EN UK
t +44 (0)151 350-6666 f +44 (0)151 350-6600 www.sgs.com

SGS 9001-8 01 0216

SYSTEM CERTIFICATION ISO 9001 SGS

UKAS MANAGEMENT SYSTEMS 0005


Appendix C - Sample of Pump Certific

Test Report for Pump

ISO 9906 Annex A





MODULAR PUMPSET TESTING , TEST AS A COMPLETE ASSEMBLY



C A E ENGINEERING PTE LTD

PUMP PERFORMANCE FINAL REPORT - ELECTRIC

CLIENT : TEST
ADDRESS 28 boonlay way, #01-88
singapore 609970
CLIENT CONTACT :

TEST PREMISES cae - boonlay test bay
ADDRESS 28 boonlay way, #01-88
singapore 609970

JOB NO.
DATE :
PROJECT :
PUMP TYPE/SIZE :
PUMP SERIAL N°

DUTY POINT: FLOW(l/s): 27.0 HEAD(m): 60.0

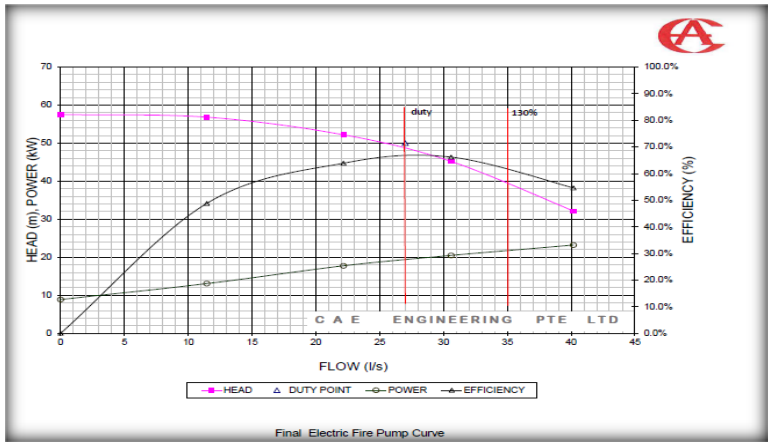
**** PUMP TESTING CARRIED OUT IN ACCORDANCE WITH AS2417 EXCLUDING CAVITATION AND AS2941 ****

PT.	FLOW (l/s)	GAUGE READINGS DISCH. (m)	GAUGE READINGS SUCT. (m)	VELOCITY HEAD DIFF. (m)		TOTAL HEAD (m)	POWER MEASUREMENT METER CONST: 1.0 Power (kW) METER	POWER MEASUREMENT Current (A)	MOTOR EFF. (%)	PUMP POWER INPUT (kW)	PUMP POWER OUTPUT (kW)	PUMP EFF. (%)	PUMP SPEED (RPM)
1	0.0	59.3	1.7	0.00		57.5	9.9	18.6	90.2%	8.9	0.0	0.0%	2900
2	11.5	58.5	1.7	0.01		56.8	14.4	24.2	91.1%	13.1	6.4	48.8%	2900
3	22.2	53.9	1.8	0.05		52.2	19.4	31.0	91.3%	17.7	11.3	63.9%	2900
4	30.6	45.9	1.8	0.10		45.2	22.7	35.5	90.4%	20.5	13.6	66.2%	2900
5	40.2	33.7	1.7	0.18		32.2	25.9	40.3	89.4%	23.2	12.7	54.6%	2900
6													
7													
8													
9													
10													
11													

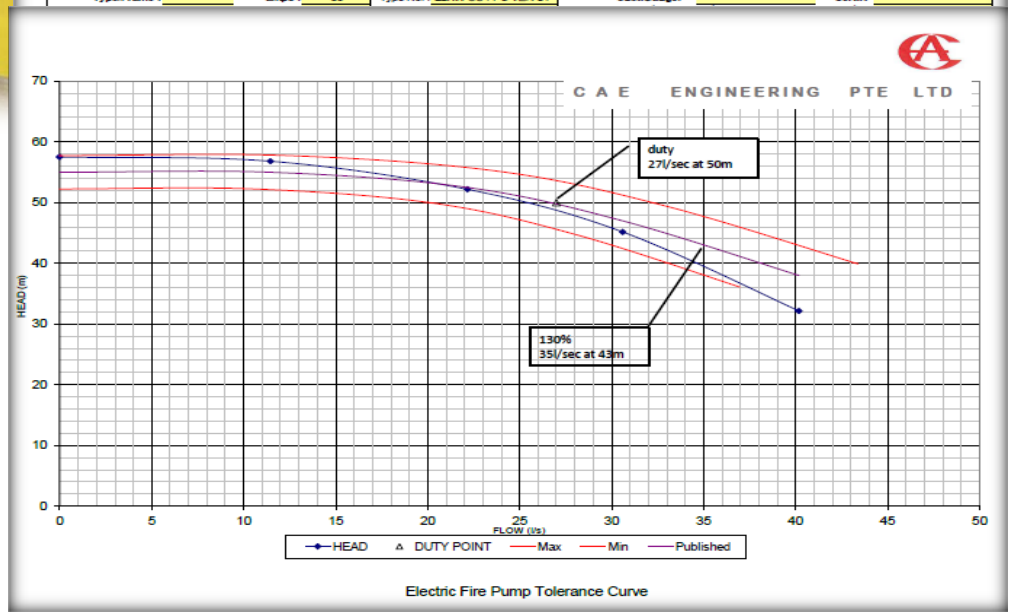
MOTOR
Make : motorlogy
Type/Frame :
kw : 22.0
amps : 38

CONTROL PANEL
Make : CAE
Type No. : 22KW SS FPC VER-01

MEASURING INSTRUMENTATION
HEAD Disch.Gauge: Cert.N°
Suct.Gauge: Cert.N°



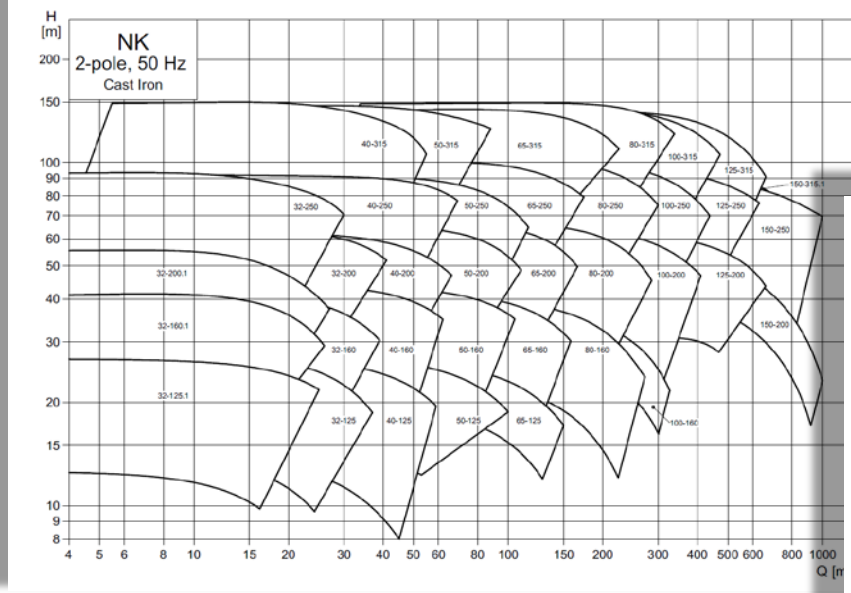
Final Electric Fire Pump Curve



Electric Fire Pump Tolerance Curve

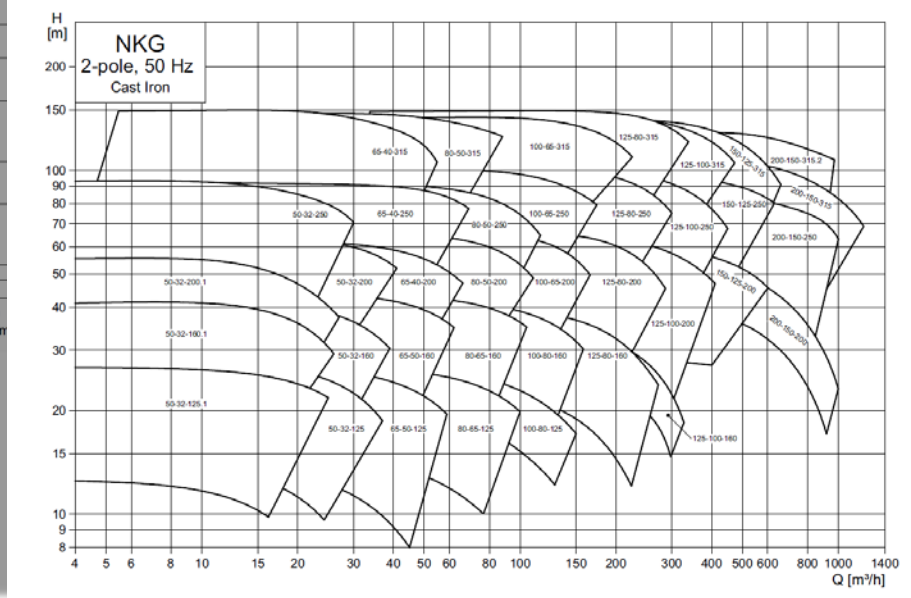
End Suction range (NK/NKG)

NK, 2-pole



Performance Area For Grundfos End Suction

NKG, 2-pole



Type of pumps



End Suction Pumps

Features & Benefits

- Optimised hydraulics in housing and impeller = unimpeded liquid flow
- O-ring seal between pump housing and cover = no risk of leakage
- Housing, impeller & wear ring in different materials = improved corrosion resistance, no sticking elements
- Back pull-out design for easy dismantling for service
- Pump is electro-coated to increase corrosion resistance
- Available with IE1, IE2 and IE3 motors
- PN 10/16 and 25 bar
- Temperatures up to 180 °C
- Available in a number shaft seal & material variants.



Jocky Pumps

Features & Benefits

- Compact design
- Modular design/customised solutions
- High reliability
- Low noise level
- High-performance hydraulics



Split Case Pumps

Cast iron, bronze fitted as standard. Stainless steel and duplex are available for certain models.

FIRE PUMP CONTROLLERS

BUILT TO AS2941-2013 (5TH EDITION)

Model : FPC VER-01

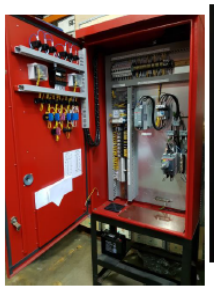


Standard Features

- IP55 ENCLOSURE
- INCOMING,OUTGOING AVAILABLE INDICATION
- PHASE REVERSAL /LOSS ALARM
- PUMP ON DEMAND, RUN, OVERCURRENT, FAILED TO START INDICATION
- AC AMPERE DISPLAY
- BATTERY CHARGER DC VOLTAGE, AMPERE DISPLAY
- START AND STOP PUSHBUTTONS
- LAMP TEST PUSHBUTTON
- REMOTE START PROVISION
- INTERLOCK AND LOCK OUT PROVISION
- BUZZER WITH MUTE PUSHBUTTON
- VOLTAGE FREE CONTACT FOR REMOTE MONITORING

Options

- OP1 - Anti-condensation heater & thermostat
- OP2 - Data log, pressure & event recording
- OP3 - Modus with RS485 connection





C A E ENGINEERING PTE LTD

FIRE PUMP MODULAR SYSTEM

PRE-ASSEMBLY AND TEST ON A COMMON MANIFOLD



Model : CAE-HR-BS VER 01

The Fire Hosereel Boosters set are simple and reliable system, consisting of 2 Pumps , connected in parallel and mounted on a common skid base.

The Fire Hosereel Boosters set are supplied as complete, pre-assembled and tested system including suction and discharge manifolds, isolating valves, non-return valves, pressure switches and gauges.

The controller comes with motor protection , incoming indication, water level sensor with high/low level indication, Run/stop/trip indication for each pump , auto/off/manual selector , manual start/stop pusbutton and duty/standby selector switch.

Standard Features

- IP55 ENCLOSURE (SUITABLE FOR OUTDOOR USAGE)
- 2 PUMPS OPERATION (1 DUTY + 1 STANDBY)
- TEST RACK WITH PRESSURE GAUGE AND SWITCHES

Optional Features

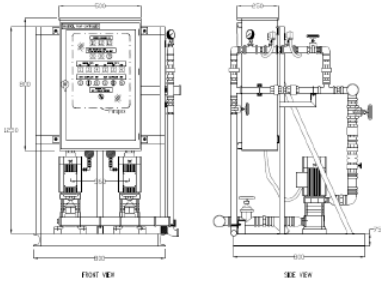
- DATA LOG (PRESSURE , PUMP STATUS, DATE AND TIME RECORDING)
- HOUR RUN METER FOR EACH PUMP
- VOLT/AMP/POWER METER FOR CONTROLLER

System Operation

When the hose is opened, Water will be drawn from the system. The pressure will drop to the first cut-in pressure level, and the duty pump will be activated.

When the water demand increases, the stand-by pump will cut-in until the performance of the pumps in operation corresponds to the demand.

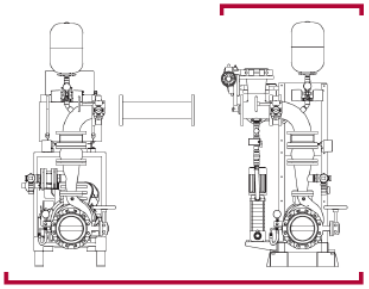
As the water demand falls, the discharge pressure will rise to the first cut-out pressure level and the pressure switch will cut-out one pump . as water demand continuous to falls, the other pump will eventually cut-out, and in preparation for the next demand cycle.



FIRE PUMP SYSTEMS



Example of a single pumping unit



Example of a pumping set with two pumps

Model :

CAE-FP-2E/1ED/2DD VER 01

The Fire Pump System are simple and reliable system, consisting of 1 Jockey Pump and 2 Main Pumps , connected in parallel and mounted on a common skid base.

The Fire Pump Systems are supplied as complete, pre-assembled and tested system including suction and discharge manifolds, isolating valves, non-return valves, pressure switches and gauges.

The controller comes with IP55 enclosure incoming and outgoing indication. Phase reversal, loss alarm. Pump on demand, overcurrent, failed to start, run and stop indication. Batt charger DC voltage and ampere display. Auto/off/manual selector, manual start, stop and lamp test pushbutton. Buzzer with mute pushbutton. Duty/standby selector switch. Voltage free contact for remote monitoring.

Equipment supplied as standard

- JOCKEY PUMP
- 2 MAIN FIRE PUMPS (1 DUTY + 1 STANDBY)
- FIRE PUMP CONTROLLERS
- INTER-CONNECTING MANIFOLD
- TEST RACK WITH PRESSURE SWITCHES/TRANSDUCER, GAUGES AND VALVES.

Optional Features

- DATA LOG (PRESSURE , PUMP STATUS, DATE AND TIME RECORDING)
- PRESSURE VESSEL TANK
- VOLT/AMP/POWER METER FOR CONTROLLER

System Operation

In the event of a fall in pressure, the Jockey Pump will automatically start, its control operation is via the pressure switch.

Should the flow provided not sufficient to cope with the demand, the Duty Main Fire Pump will automatically be started via the pressure switch and continue to operate until manually stopped.

The standby Main Fire pump will automatically start, should the Duty Main Fire Pump Failed. Once the standby Main Fire Pump start. it continue to operate until manually stopped.

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Project Reference



Government
- Cantoment police HQ
- ICA building
- Ministry of Manpower
- Changi Airbase
- Bedok Camp
- Kranji Camp
- Nee Soon Camp
- LCK Camp



High Rise (Office/Residential/Mix Use)
- Tanjong Pagar Mix development
- J. gateway condo
- DBS building
- EON shenton
- HDB C50/N4C10/RC25A/N4C28
- The Triling condo
- Brighthill condo





Airports
- Changi Airport T3
- Changi Airport T4
- Changi Airport Jewel



College / School
- NUS E4
- NUS S8
- NTU
- NTU learning centre
- Temasak Poly
- GEM college





Power Sub Station
- Sunview
- Punggol
- Bulim
- Boon keng
- Yishun



Factory / Warehouse
- Google data centre
- Telin data centre
- GE
- GSK
- Hafary
- Toyogo
- Hyflux
- JEP



Thank You For Your Attention

Questions ?

