

بسم الله الرحمن الرحيم

اللَّهُ نُورُ السَّمَوَاتِ وَالْأَرْضِ مِثْلُ
نُورِهِ كَمِشْكَاةٍ فِيهَا مِصْبَاحٌ الْمِصْبَاحُ فِي زُجَاجَةٍ الزُّجَاجَةُ
كَأَنَّهَا كَوْكَبٌ دُرِّيٌّ يُوقَدُ مِنْ شَجَرَةٍ مُبَارَكَةٍ زَيْتُونَةٍ لَا شَرْقِيَّةٍ وَلَا
غَرْبِيَّةٍ يَكَادُ زَيْتُهَا يُضِيءُ وَلَوْ لَمْ تَمْسَسْهُ نَارٌ نُورٌ عَلَى نُورٍ
يَهْدِي اللَّهُ لِنُورِهِ مَنْ يَشَاءُ وَيَضْرِبُ اللَّهُ الْأَمْثَلَ لِلنَّاسِ وَاللَّهُ
بِكُلِّ شَيْءٍ عَلِيمٌ ﴿٣٥﴾

صدق الله العظيم

سورة النور الآية (35)

DEDICATION

To

*My parents, family, teachers,
friends and all persons who be
devoted to me.*

TO

*All those heroes who have lost
their altruistic lives during fire
fighting and fire rescue.*

ACKNOWLEDGEMENT

First we thank God that helps us with his blessings to accomplish this dissertation.

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Abstract

Fire is the main hazard that is enough to cause a huge damage, so fire safety is a system of work that is paramount system for different engineering works such as architecture, electrical and mechanical engineering. Fire fighting system is consider aims very effectively which could be implemented by; prevention to make sure fires don't start, precaution to minimise the damage from fire and procedures as an action to take in the event of fire. Different systems can be used to design a fire fighting system depend on the agent that uses in the system. In this thesis two different cases used to analysis three fire fighting systems; the first case is a production workshop, in this case compared between analytical calculation and software simulation of wet sprinkler system. In the second case FM-200 system and CO₂ system applied separately in educational electronic lab using software simulations and compared between these two systems.

المستخلص

النيران من المخاطر الرئيسية التي تتسبب في أضرار وخيمة, لذا فإن نظام الحماية من الحريق يعتبر نظاما مهما لمختلف مجالات الهندسة مثل هندسة المعمار والهندسة الكهربائية والهندسة الميكانيكية. نظام مكافحة الحريق يراعي عمليا مجموعة أهداف مثل ؛ منع اندلاع النيران وتقليل الأضرار الناجمة عن النيران و عمل بعض الإجراءات في حال إندلاع النيران. هناك العديد من الأنظمة التي تستخدم في تصميم أنظمة مكافحة الحريق إعتمادا علي المادة العاملة المستخدمة في النظام. في هذه الأطروحة تم إستخدام حالتين مختلفتين لتحليل ثلاثة من أنظمة مكافحة الحريق; الحالة الأولى عبارة عن ورشة إنتاج, في هذه الحالة تم تطبيق نظام الرشاشات الرطب بإستخدام الطريقة التحليلية و برنامج المحاكاة وتمت المقارنة بينهما. أما الحالة الثانية فقد تم فيها تطبيق كل من نظام الهالون (FM-200) ونظام ثاني أكسيد الكربون منفصلين لمعمل إلكترونيات بإستخدام برنامج محاكاة لكل نظام وقد تمت المقارنة بين النظامين.

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ABBREVIATIONS

APW	Air-Pressurized Water
A_s	Area of coverage per sprinkler
C	Friction loss coefficient
CO ₂	Carbon dioxide
d	Actual internal diameter of pipe in inches
D_d	Designing density
FM	Factory Mutual research global
GPM	Gallon per minute
HFCs	Hydro fluoro Carbons
k	Nozzle Factor
L	Larger distance between sprinklers
NFPA	National Fire Protection Association
ODP	Ozone Depletion Potential
p	Frictional resistance in psi per foot of pipe
P_{drop}	Pressure drop
P_{st}	Pressure at the Farther Sprinkler Head
Q	Flow in gpm
QR	Quick-Response Sprinkler
QRES	Quick-Response Early Suppression Sprinkler
Q_{st}	Discharge at the farther sprinkler head
S	Shorter distance between sprinklers

SFR	Fast Response Sprinkler
UL	Underwriters Laboratories
ULC	Underwriters' Laboratories of Canada