Q. **Upgrade Fire Protection System - Bishop's Falls, Vol. I, p. D-57**

Please provide a copy of the FM Global Report referenced at p. D-57.

A. A copy of the referenced FM Global Report is attached.

Risk Report

Location Findings

FM Global

Newfoundland & Labrador Hyrdo-electric Corporation
Maintenance Centre
Bishop Falls
Bishop's Falls, Newfoundland A0H 1C0
Canada

Fire & Natural Hazards
Baseline Risk Evaluation
Visit by Guy Labonte on
19 July 2004 in conference with
Mr. Don Barrett, Risk Manager

Understanding the Hazards at this Facility

The largest fire hazard at this facility is the inadequate water supply feeding the existing automatic sprinkler systems protecting the two main buildings at this repair and service complex. The design of automatic sprinkler systems is based on the operation of a minimum number of sprinklers operating at a design flow and pressure. Water testing during this visit indicated that the needed water supply for the sprinkler systems is not existent. Under a fire condition, if there is not adequate water at sufficient pressure to the sprinkler systems, control of the fire by automatic sprinklers will not occur. The total loss of the building involved in the fire is then expected. The loss of the main store or garage at this complex would have serious repercussions on the overall day to day operations of all other locations of this insured.

Another large fire hazard that is threatening the operations at this facility is the lack of supervision, maintenance and testing of the automatic fire protection systems. In order to be effective against fire, automatic sprinklers need to have water delivered to them through a piping arrangement, which includes the lead-in, sprinkler risers and branch lines. A valve closed anywhere on the water supply can stop the flow of water to the sprinklers. FM Global loss data clearly indicates that a fire without an operational sprinkler system can be more damaging than an unsprinklered fire and can even grow to the complete destruction of the building.

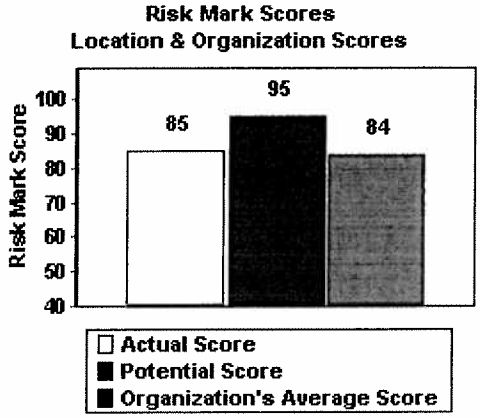
The insured indicated that efforts will be made to address the water supply problem.

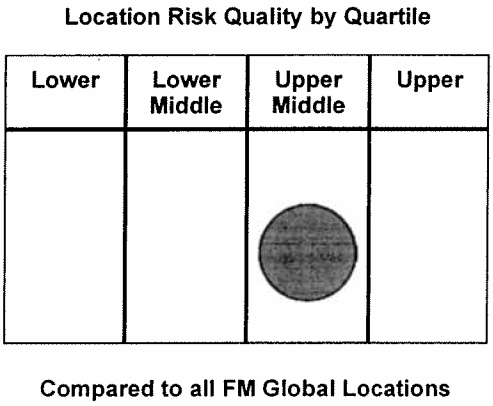
Location Overview

The following display shows the "Risk Mark" scores calculated for this location. Risk Mark is a benchmarking tool which rates the risk quality of the associated location on a scale of 0-100 (lowest to highest quality). The Risk Mark score is calculated taking into account fire hazards, inherent natural hazards, and FM Global loss history for locations with similar occupancies.

The first chart shows the location score, the location potential score (assuming all recommendations are completed) and the organization's average score (weighted by location value). The potential score may be less than 100 because some hazards cannot be eliminated and some occupancies are inherently more hazardous; each factor can result in an automatic deduction.

To assist in comparison of this location's score relative to other FM Global locations, the second chart displays the range in quartiles of all scores for the locations FM Global has visited worldwide. The colored circle indicates in which quartile this location's score falls. For reference, the lower quartile represents the lowest range of scores and risk quality whereas the upper quartile represents the highest.





Management of Exposures

Certain potential hazards and conditions were evaluated at this facility. Completion of the following items will help lower both the frequency and severity of losses and minimize the possibility of costly interruptions to your business.

04-07-001

Verify the operation of the electric booster pump and its associated water supply.

The facility water supply should be investigated to determine why the booster pump performance is so poor and why the town water supply is also so poor.

04-07-001 (continued)	
The Hazard	In order to be effective in the event of a fire, the installed automatic sprinkler systems need to receive water at a predetermined pressure and flow. Without the needed pressure and flow, water coming out of the fused open sprinkler heads will simply drip from it instead of being pushed out in an umbrella shape as it was designed for. This will result in inadequate volume of water being discharged onto the fire through the raising hot fire plume and also into an inadequate pre-wetting of surrounding combustible not yet involved in the fire to limit the fire spread. This could lead to the total destruction of the building involved in the fire.
Technical Detail	The following items should be completed in this verification process: - the town water supply control valves located between the town gravity tower and the facility pump house are all in the wide open position. The low results obtained during the water flow test without the pump indicates that the water supply is of very limited quantity. - the pressure relief valve installed on the booster pump should be verified for proper operation. The seat of the valve might be cut. Ultimately, the piping arrangement should be modified to eliminate the return of the water back to the suction side of the pump. - the rotation of the pump impeller should be verified for proper rotation.
Status	Mr. Barrett indicated that the commissioning document for the pumps will be search for to find if the pump ever worked properly. Mr. Foss indicated that they will verify for close valves in the town supply.

01-08-003	**Create a fire protection equipment inspection program,** A fire protection inspection and test program should be implemented and should include the following:
The Hazard	Every effort should be made to make sure sprinkler protection is in service at all times. If there was a shut sprinkler control valve during the development of a fire, no water would be available to the sprinklers to control the fire. By the time the valve was reopened, the fire would likely be out of control and the sprinklers would have insufficient water pressure to bring the fire under control. Extensive property damage and disruption to business would be the result. This hazard can be significantly reduced by performing weekly visual checks.

Part A.	**Conduct weekly visual valve inspection and automatic start-up of the booster pump.** Weekly recorded inspections calls for the visual verification for the open and locked position of all sprinkler control valves and the automatic start-up test of the electric driven booster pump by creating a water pressure drop in the fire protection system.
Status	Mr. Foss indicated that this program will be implemented with the document supplied by the writer. The pump test will be started only once the pump condition is returned to a satisfactory condition.
Part B.	**Conduct monthly physical testing of all curb box valves and wall mounted valves.** Monthly physical tests should be performed on the wall post indicator valve and the underground curb box valves controlling the water supply to the automatic sprinkler systems at this facility.
Status	Mr. Foss indicated that this program will be implemented but that the underground curb box valves will not be checked from November to April (winter season).

01-08-001	**Improve the existing hot work policy and permit by extending the fire watch.** The existing hot work policy should be revised as follows: • The policy and permit should include a statement for the use of a formalized hot work permit system for any cutting, welding, brazing, soldering, grinding, applying roof covers, etc. • The hot work policy and permit system should be incorporated into the corporate document managing contractors on site. • The fire watch period should be extended. The fire watch should be provided during and for 60 minutes after work, including any coffee or lunch breaks. The hot work area should then be monitored for an additional period of 3 hours.

01-08-001 (continued)	
The Hazard	Hot work comes in a variety of applications, each with its own heat source severity. Under the right conditions, even hot work heat sources with the lowest temperature ratings can easily ignite what seems to be hard to burn products. A fire in a hidden area can go unnoticed until it is well established. Many hot work fires will smolder for several hours before breaking out in open flames. Hot work ignition sources can get into areas that are not easily seen, such as through operating HVAC systems, in pipes extending through walls/floors, through openings in floor and in concealed spaces with combustible construction. A fire starting in an uneasily accessible area could grow to an uncontrolled severity and put the entire facility's operation in jeopardy for a lengthy period.
Status	Mr. Barrett indicated that the safety committee at the Corporate level has review the proposed permit and is still not decided on how to apply the 4 hours of afterwork supervision.

01-08-002	**Improve the existing Emergency Organization by including valve and pump persons.** The existing Emergency Organization should be expanded to include the following positions in writing with names and duties of all members clearly defined and assigned. • Fire pump operator to ensure the pump starts and continues to run the fire pump during the emergency. • Sprinkler control valve operator to make sure the sprinkler control valve for the affected area is open. If it is safe, the operator would remain at the valve and see that it remains open until the person-in-charge or public fire department instructs that it be closed.
The Hazard	One of the problems that can occur during an emergency is that the fire pump may not start. FM Global recently conducted a study of losses at 318 facilities with a fire pump. The analysis showed that in 163 instances, the fire pump operator failed to respond to the fire pump house to confirm the fire pump had started. If the fire pump does not start, a small fire in the warehouse would quickly establish within the first two minutes of the fire and grow in size and expose adjacent equipment. The public fire department would typically arrive within 6-8 minutes and fight the fire with hoses, however, by this time the fire would be fully involved and equipment damaged.
Status	Mr. Foss indicated that the facility fire chief will be asked to consider how to address this suggestion.

01-08-004	**Improve the storage arrangement of the plastic pails of oil and the paint cans in the warehouse.** One of the following should be completed for the storage of oils in plastic containers and storage of paints and thinners: • The liquids should be relocated to a cutoff room with one hour rated walls and roof. Sprinkler protection and containment should be provided in the room. • Or, the liquids should be stored in a noncombustible detached building. • Or, the liquids should be stored in Factory Mutual Approved flammable liquid cabinets.
The Hazard	A total of approximately 32 plastic 5 gal. pails of oils and 50-1 gal. metal paint cans are being stored inside Building No. 3. Should one of the plastic containers rupture, the contents of the container would form a pool of liquid on the floor. Ignition of the liquid would result in a pool fire which would spread to other areas of the warehouse. Fire testing of combustible liquids in plastic containers has demonstrated that a fire in the containers cannot be controlled effectively by sprinkler
Status	Mr. Foss indicated that they will be looking at possibly storing the oil in a detached building and the paint cans in an Factory Mutual approved flammable liquid cabinet.

01-08-005	**Conduct a flushing investigation on the dry sprinkler system protecting Building No. 3.** The dry pipe system, installed back in the 70's, should be thoroughly investigated for obstructions from corrosion. Advance notice of two weeks should be given to the Montreal office of FM Global such that a consultant can be made available to witness the flushing investigation procedures.
The Hazard	Dry pipe sprinkler systems are particularly susceptible to the development of internal pipe scale from corrosion. This hard scale can form due to the condensation of moisture in the piping. Nuisance trips of a system such as from an accidentally broken sprinkler head can add to the problem. A significant amount of scale in the piping can block sprinkler heads during a fire situation and the effective control of the fire by sprinklers is eliminated due to the obstructed flow of water. There is a documented history of sprinkler systems failing in this manner with subsequent large losses resulting. A flushing investigation will determine the level of scale in the sprinkler system.

01-08-005 (continued)	
Status	Mr. Foss indicated that the sprinkler contractor Viking will be asked to submit a quotation for this work in the coming week.

04-07-002	**Conduct regular infrared thermographic surveys.** Regular infrared thermographic survey of the facility electrical distribution systems should be conducted, especially inside all unsprinklered building.
The Hazard	Malfunctioning electrical equipment can be the ignition source for a major fire. In a recent 10-year period, FM Global clients experienced nearly 1,500 losses where electrical ignition was the probable cause. If defective electrical components were identified early enough for maintenance to be performed, many of these losses might have been prevented. Infrared testing is a useful, practical tool for identifying defective components and other conditions that could result in electrical fire or electrical breakdown. In unsprinklered protected building, it is a of vital importance to minimize all ignition sources.
Status	Mr. Foss indicated that he will verify the possibility of having a technician from one of the insured generating stations to come over and perform the suggested survey.

04-07-003	**Provide sprinkler protection inside the concealed space of the 1990 extension of Building No. 3**
Status	Mr. Foss indicated that the contractor Viking will be asked to submit a quotation for this work in the coming weeks.

Risk Reduction

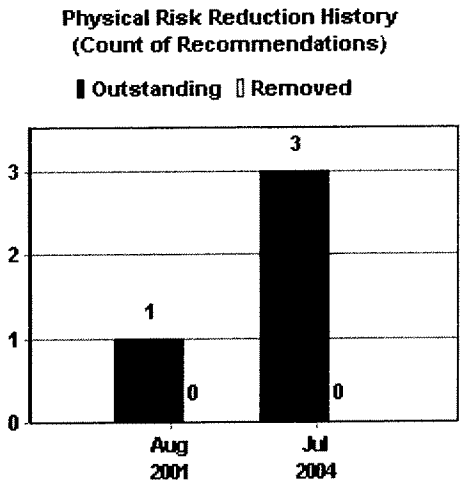
Recommendations that have been completed or otherwise removed are summarized in this section.

The "counts" of recommendations referenced in this section include each part of multi-part recommendations except in cases where each part represents optional ways to address a single hazard. In such cases, the recommendation is only counted once.

Physical Recommendations

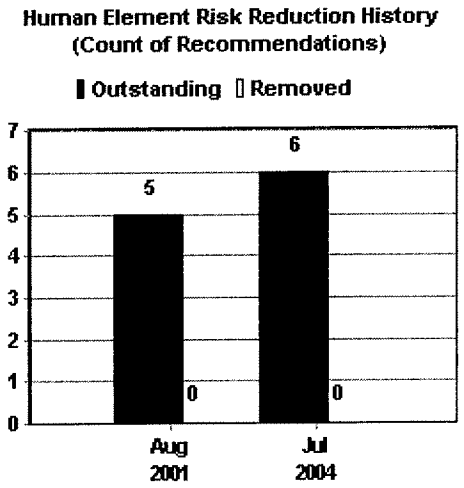
No **Physical** recommendations have been completed or removed since our last evaluation.

Physical Recommendations (continued)



Human Element Recommendations

No **Human Element** recommendations have been completed or removed since our last evaluation.



Ongoing Services

FM Global is available to provide support in all areas of property loss prevention. These services include:

- Development of specifications for projects such as new construction, automatic protection systems, and process safeguards
- Review of related project plans
- Assistance in implementing and managing loss prevention programs
- On site review and acceptance of completed projects
- Assistance in managing impaired protection systems

For access to these services, contact one of the following:

- Montreal Operations:
  FM Global
  600 rue de la Gauchetiere West
  14th Floor
  Montreal, QC H3B 4L8
  Canada
  [1] (514) 876 7400

- Daniel Paulikot, Account Engineer:
  165 Commerce Valley Drive West
  Suite 500
  Thornhill, Ontario, L3T 7V8
  Canada
  [1] (905) 763 5555

Reference Information

Site Contact: Mr. Don Barrett, Risk Manager at [1] (709) 2582316
Final Conference Attendees: Mr. Don Barrett, Risk Manager; Mr. Tom Foss, Maintenance Supervisor
Location Index Number: 000006.15-01
Account Number: 01-74568
Risk Mark Information included in this report is current as of 05 August 2004.