Design Guidelines for Hydraulic Load Locking Valves for Use in Coal Mines

Produced by Mine Safety Operations Division,
New South Wales Department of Primary Industries

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Design Guidelines For Hydraulic Load
Locking Valves

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Note
This is an extract of the Mine Safety and Health Administration of the U.S. Department of Labour issued on 17th October, 1980

1. Scope
All hydraulic cylinders used to elevate cutting heads and conveyor boom loading machines and continuous mining machines shall be equipped with hydraulic load locking valves meeting this criteria.

2. Requirements
The hydraulic cylinder assemblies which elevate conveyor booms and cutting head shall be equipped with load locking valves to prevent unintentional fall of the boom or cutting head in the event of hydraulic circuit failure. If the boom or cutting head is elevated to more than one cylinder, each cylinder shall be equipped with a load locking valve capable of holding the boom or cutting head in position.

Each cylinder load locking valve must meet the following requirements:

1. The load locking valve must be attached directly to the cylinder port that is subject to the hydraulic pressure induced by the weight of the boom or cutting head.

2. The rated working pressure of the load locking valve must be greater than the system operating pressure.

3. If the load locking valve has over-pressure relief capability, the pressure needed to support the static weight of the boom.
4. If the load locking valve is pilot operated, the hydraulic system shall ensure that the residual pilot pressure will not hold the load locking valve open when the control valve (located in the operator’s compartment) is in the neutral position.

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SINGLE ACTING CONVEYOR BOOM ELEVATE CYLINDER WITH AN OVERCENTER VALVE DIRECTLY ATTACHED

2 DOUBLE ACTING HEAD ELEVATE CYLINDERS WITH AN OVERCENTER VALVE DIRECTLY ATTACHED TO EACH CYLINDER

OVERCENTER VALVE ATTACHED DIRECTLY TO EACH CYLINDER

NOTE
P1, P2 = SYSTEM PRESSURE, MAX.
P3 = OVERPRESSURE RELIEF (CONVEYOR)
P4 = OVERPRESSURE RELIEF (HEAD)

EXAMPLE OF CONTINUOUS MINING MACHINE CONVEYOR BOOM ELEVATE AND CUTTING HEAD ELEVATE HYDRAULIC SYSTEM USING AN OVERCENTER VALVE ON EACH CYLINDER

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CONVEYOR BOOM ELEVATE CYLINDER WITH A PILOT-OPERATED CHECK VALVE ATTACHED TO CYLINDER

HEAD ELEVATE CYLINDER WITH A PILOT-OPERATED CHECK VALVE DIRECTED ATTACHED TO EACH CYLINDER

PILOT OPERATED CHECKS ATTACHED TO EACH CYLINDER

BOOM AND CUTTING HEAD ELEVATE CONTROLS IN OPERATOR'S COMPARTMENT

EXAMPLE: CONTINUOUS MINER WITH PILOT-OPERATED CHECK VALVES ON BOOM AND CUTTING HEAD ELEVATE CYLINDERS

NOTE: P1, P2 = SYSTEM PRESSURE, MAX.

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