

Appendix B: Spreader Stoker-Fired Boiler System Descriptions and Troubleshooting Diagrams

This TSG Appendix deals with identifying and solving potential coal quality-related problems that can be encountered in spreader stoker-fired boiler systems. A general description of this system is included, but is limited to describing the major components (coal hopper, feeder-distributor mechanism, coal-ash bed grates, damper controls) that make up a complete spreader stoker-fired boiler system. For those interested, more detailed descriptions are provided in references 6, 7, 8.

This Appendix includes a generalized block flow diagram of a complete overfeed stoker-fired boiler system that:

- identifies the specific components comprising the major subsystems of an overfeed stoker-fired boiler system
- logically presents the flow of coal, flue gas, and ash through the system
- helps determine the existence and location of subsystems and specific components comprising the system.

Following the block flow diagram is a component/symptom table that serves to identify:

- typical symptoms (problems) that may be encountered in the system
- the various components shown in the block flow diagram affected by these symptoms
- the logic diagram to determine whether the problem is due to operational procedures or to out-of-specification coal.

The Troubleshooting Logic Diagrams for this Appendix are presented next. However, before proceeding, the reader is encouraged to read Chapter 2 to understand the structure of each Appendix and how to apply these logic diagrams to diagnosing coal quality-related problems. The Glossary, List of Abbreviations, and References preceding the Appendixes should resolve any questions that arise regarding terminology and laboratory procedures.

B1 System Description

A mechanical stoker is a device equipped with a mechanically operated coal feeding mechanism and a grate. The mechanical stoker is used to feed coal into the boiler, distribute it over a coal ash-bed grate, admit air to the coal bed for combustion and remove or discharge refuse. A specific mechanical stoker type is the spreader stoker.

In a spreader stoker, coal is spread evenly over the entire grate surface by mechanical feeders located at the stoker front above the grate. Because the coal is thrown onto the grate, fine coal particles burn in suspension above the grate. Larger coal particles ignite while in suspension but fall to the grate surface to complete the combustion process.

The spreader-stoker feeder functions to vary the supply of coal to the furnace and to provide even distribution on the grates. In the feeder-and-distributor mechanism (Figure 2-1) there is a reciprocating feed plate that moves coal from the bottom of the hopper over an adjustable spill plate. The length of stroke of this plate determines the rate at which coal is fed into the furnace. The coal leaving the hopper drops from the end of the spilling plate into the path of the rotor blades, which distribute the coal on the grates. The in-and-out adjustment of the spilling plate changes the point at which coal comes in contact with the rotor blades. Moving the spilling plate back from the furnace allows the coal to fall on the rotor blades sooner. The blades impact more energy to the coal, and it is thrown farther into the furnace. Increasing the rotor speed impacts more force to the coal, throwing it farther into the furnace.

Air for combustion is supplied to spreader stokers by forced-draft fans. Air is forced through the fuel bed from underneath the grates (Figure 2-2). Suspension burning

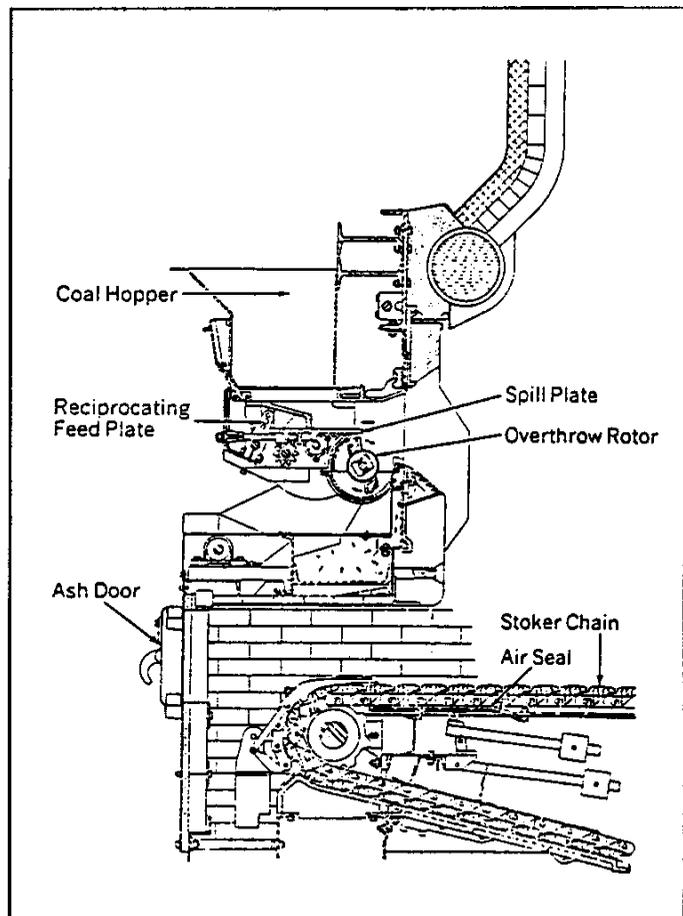


Figure 2-1. Overthrow spreader stoker with feeder and distributor mechanism.

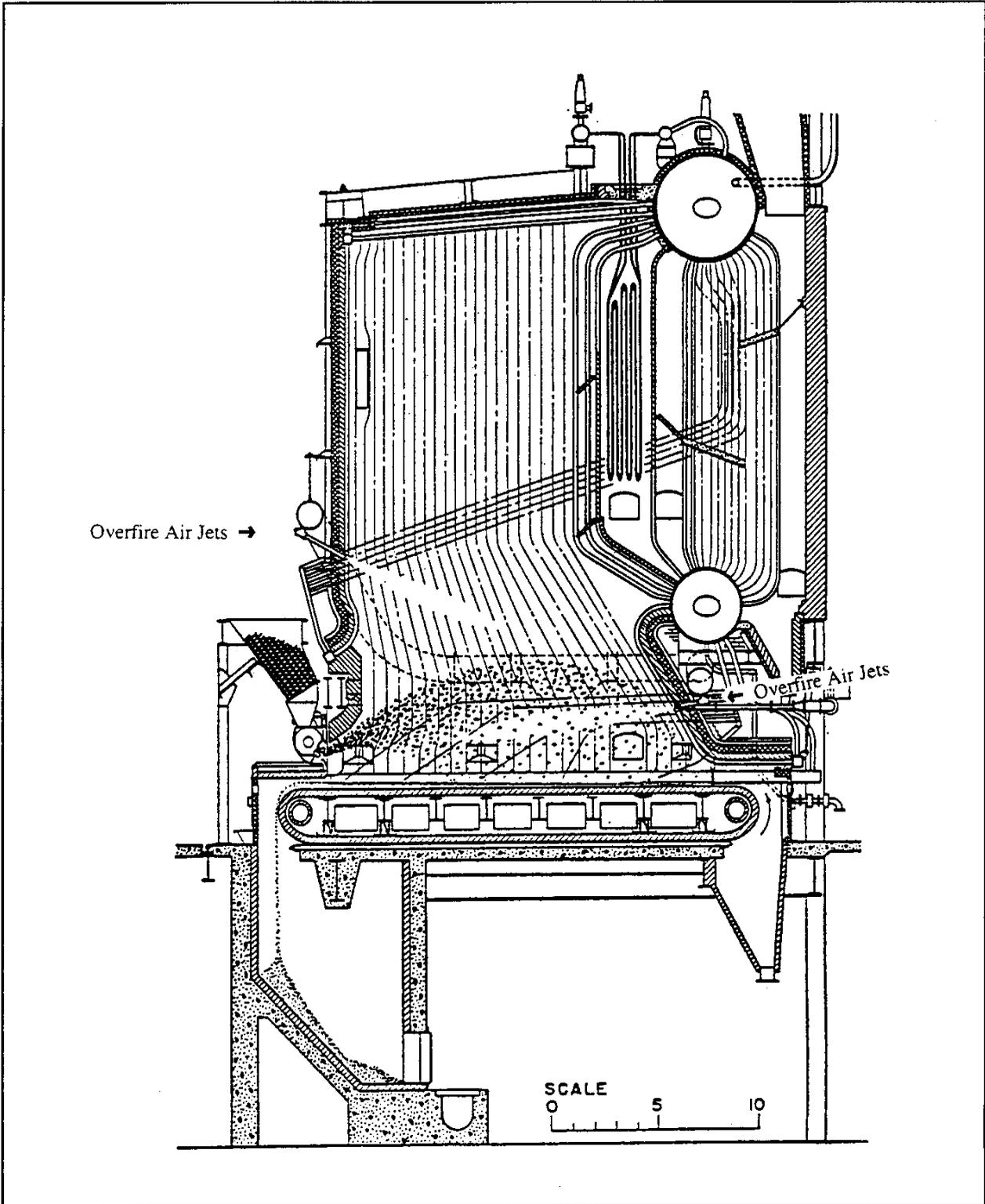


Figure 2-2. Overfire air jets.

also requires a supply of air directly to the furnace. This air is supplied by a high pressure blower and enters the furnace through ports in the walls. Such over-fire air jets provide not only combustion air but create turbulence in the furnace to mix combustible gases and provide air needed to reinject cinders from collecting hoppers.

Spreader stokers may have one of several grate types:

- *Stationary Grates.* The feeder automatically deposits coal on the grates, and air for combustion enters the furnace through holes in the grate. At least two feeders are used, and before the ash deposits become deep enough to restrict airflow, one of the feeders is taken out of service. The fuel on the grate is allowed to burn to completion and the ash is raked through the furnace door. The feeder is then started, and after combustion has been reestablished, the remaining grate sections are cleaned in like manner.
- *Dumping Grates.* (Figure 2-3) Each grate bar is tipped or opened like a venetian blind so that ash will fall into an ash pit. The tipping of grate bars can be accomplished by hand operation or automatically. The procedure of taking one feeder section out of service long enough to remove ash is the same as when stationary grates are used.
- *Traveling Grates.* (Figure 2-4) The coal falls on the grate, and combustion is completed as it moves slowly through the furnace. The ash remains and falls into the pit when the grates pass over the sprocket. Ash discharge is at the rear of the furnace.
- *Vibrating Grates.* The grates are mounted on a pivoted framework, a motor vibrates the assembly, and the ash moves along the grates toward the ash pit. The motor that produces the vibration is run at intervals by a timer. The off-on-off cycles are varied to obtain the desired depth of ash at the discharge end of the grate.
- *Overlapping (Reciprocating) Grates.* Overlapping grates are similar to shingles on the roof of a house. The grate bars are mechanically driven and move back and forth, alternately increasing and decreasing in the amount of overlap. This motion causes the ash to shift from one grate to the other and slowly move toward the ash pit. The rate of ash discharge is varied by changing the amount of travel of the grate bars.

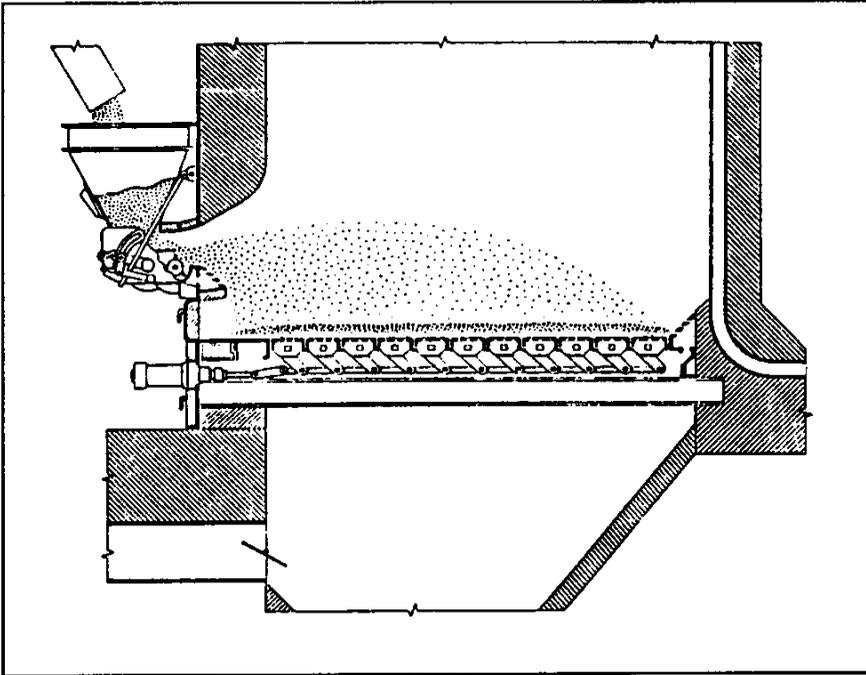


Figure 2-3. Dumping grate.

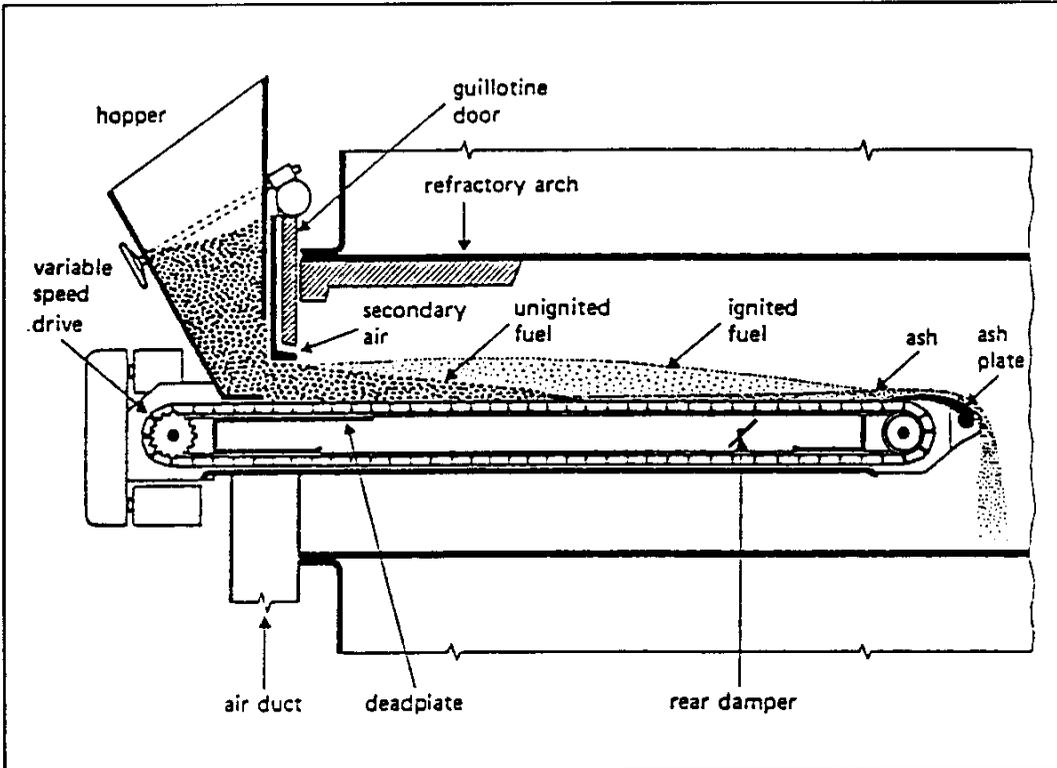


Figure 2-4. Traveling grate.

The spreader stoker is characterized by a thin bed and partial suspension, high availability, and high operating efficiency. Despite being able to fire coals of differing quality and respond to rapid load changes, it has high flyash carryover and high flyash combustible heat loss. Flyash (cinder) reinjection is used to recover some carbon in the collected flyash.

B2 Block Flow Diagram

The spreader stoker-fired boiler system has been divided into 15 specific subsystems or components (the performance of which can be significantly impacted by coal quality), sequentially arranged to show:

- coal flow through the coal handling equipment
- flue gas flow through the boiler/components, ash recycle and flue gas cleanup (FGC) subsystem, the induced draft fan and chimney/stack
- ash discharge to the ash hopper/pit.

These specific components are identified in Figure 2-5. The first six components have been grouped collectively under a category entitled coal handling equipment. The coal handling equipment includes all components that process the coal from its delivery on site to the coal feeder mechanism. It includes equipment that, depending on plant design, may include:

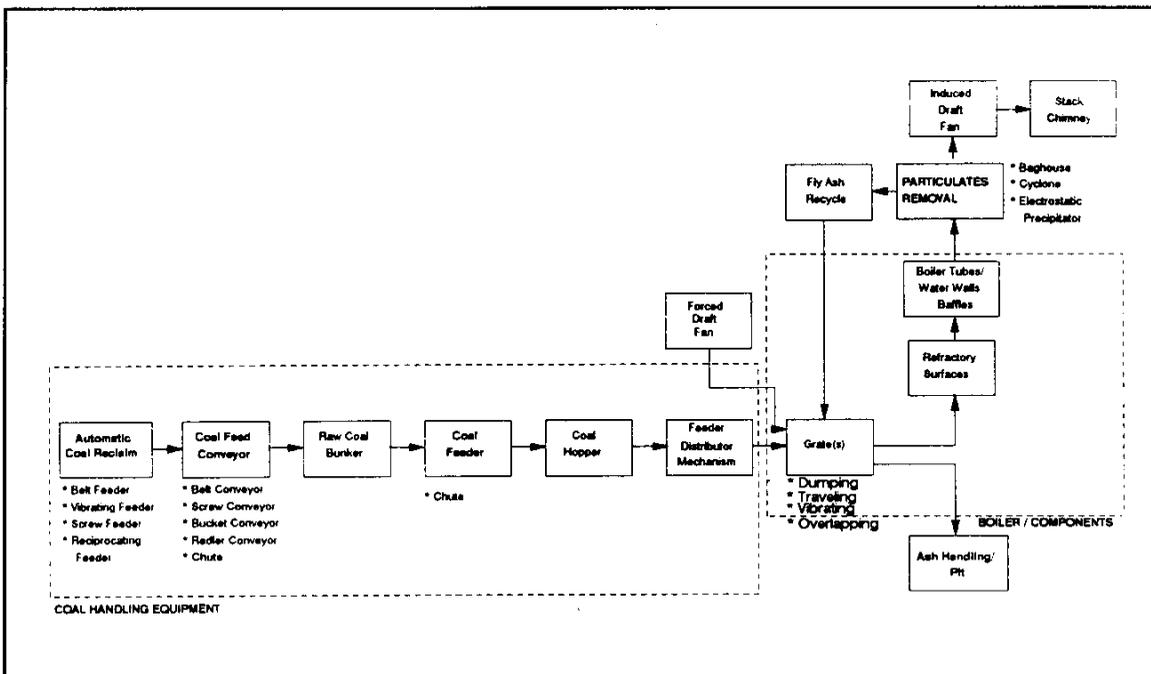


Figure 2-5. Spreader stoker-fired boiler system components block flow diagram.

- coal reclaim systems such as belt feeders, vibrating feeders, screw feeders, and reciprocating feeders
- coal feed conveyors such as belt conveyors, screw conveyors, bucket conveyors, redler conveyors, and chutes
- components that store the coal such as bunkers and hoppers
- coal feeders that transport coal to the stoker coal hopper
- coal feeder mechanism that serves to control coal flow rate into the boiler.

The next five components have been loosely grouped under the category entitled Boiler/Components, which includes equipment that, depending on plant design, may include:

- forced draft fan
- grates—specifically dumping grates, traveling grates, vibrating grates, and overlapping reciprocating grates
- refractory surfaces
- boiler tubes, water walls and baffle.

The next two blocks represent the flyash recycle and particulate removal subsystems. Three particulate removal options separately or in combination will be considered: cyclones, electrostatic precipitators, and baghouses.

The next subsystem identified in the block flow diagram is the fan subsystem. Spreader stoker-fired boiler systems use a number of fans to move air and flue gas. The major fan types addressed in the guide include:

- forced draft (FD) Fans, which supply undergrate air
- induced draft (ID) fans, which withdraw flue gas from the furnace and balance furnace pressure.

All the fans can be impacted by changes in coal quality.

The final subsystems addressed in the Guide include those components supplied to handle ash. Specific components include the chimney/stack and the ash hopper/pit.

B3 Troubleshooting Logic

The component/symptom table (Figure 2-6) serves to identify:

- Typical symptoms (problems) that may be encountered in a spreader stoker-fired boiler systems. These symptoms are arranged horizontally along the top of the table.
- The various components shown in the block flow diagram affected by these symptoms. These components are listed down the left hand side of the table in the same logical fashion as they are arranged in the block flow diagram.
- The logic diagrams.

The remainder of this Appendix consists of 92 logic diagrams, arranged by component and all the symptoms that can affect that component.

FIGURE 2-6 (Part 1): SPREADER STOKER - COMPONENT/SYMPTOM GUIDE

COMPONENT	EXCESS WEAR	PLUGGAGE	INSUFFICIENT CAPACITY	ERRATIC FEEDING	CORROSION	SEGREGATION	PRESSURE DROP	UNEVEN ASH-BED	UNEVEN COAL BED	UNEVEN BURNING	WARPED, BURNT, CRACKED	CLINKERS	CARBON BURNOUT	REDUCED EFFICIENCY	SMOKING	EROSION	SLAGGING/FALLING	FOULING	EXCESS PARTICULATE EMISSIONS	SO2 EMISSIONS
COAL HANDLING EQUIPMENT																				
Automatic Coal Reclaim																				
1) Bell Feeder	2-7	2-8	2-9	2-10																
2) Vibrating Feeder	2-11	2-12	2-13	2-14																
3) Screw Feeder	2-15	2-16	2-17	2-18																
4) Reciprocating Feeder	2-19	2-20	2-21	2-22																
Coal Feed Conveyor																				
1) Belt Conveyor	2-23	2-24	2-25	2-26																
2) Screw Conveyor	2-27	2-28	2-29	2-30																
3) Bucket Conveyor	2-31	2-32	2-33	2-34																
4) Redler Conveyor	2-35	2-36	2-37	2-38																
5) Chute	2-39	2-40	2-41																	

Figure 2-6. Spreader stoker—component symptom guide (part 1).

FIGURE 2-6 (Part 2): SPREADER STOKER - COMPONENT/SYMP TOM GUIDE

COMPONENT	EXCESS WEAR	PLUGGAGE/SYMP TOM	INSUFFICIENT CAPACITY	ERRATIC FEEDING	CORROSION	SEGREGATION	PRESSURE DROP	UNEVEN ASH BED	UNEVEN COAL BED	UNEVEN BURNING	WARPED, BURNT, CRACKED	CLINKERS	CARBON BURNOU T	REDUCED EFFICIENCY	SMOKING	EROSION	SLAGGING/S PALLING	FOULING	EXCESS PARTICULATE EMISSIONS	SO ₂ EMISSIONS
COAL HANDLING EQUIP.(CONT)																				
Coal Feeders																				
Chute		2-42	2-43	2-44																
Coal Bunker		2-45	2-46	2-47																
Coal Hopper		2-48	2-49	2-50																
Feeder Distributor Mechanism		2-51	2-52	2-53	2-54															
BOILER / COMPONENTS																				
Boiler		2-55											2-56							
1) Grates				2-57	2-58	2-59	2-60	2-61	2-62	2-63	2-64	2-65								
2) Refractory Surfaces				2-66											2-67	2-68				
3) Boiler Tubes/Water Walls				2-69											2-70	2-71	2-72			
4) Baffles				2-73											2-74	2-75	2-76			

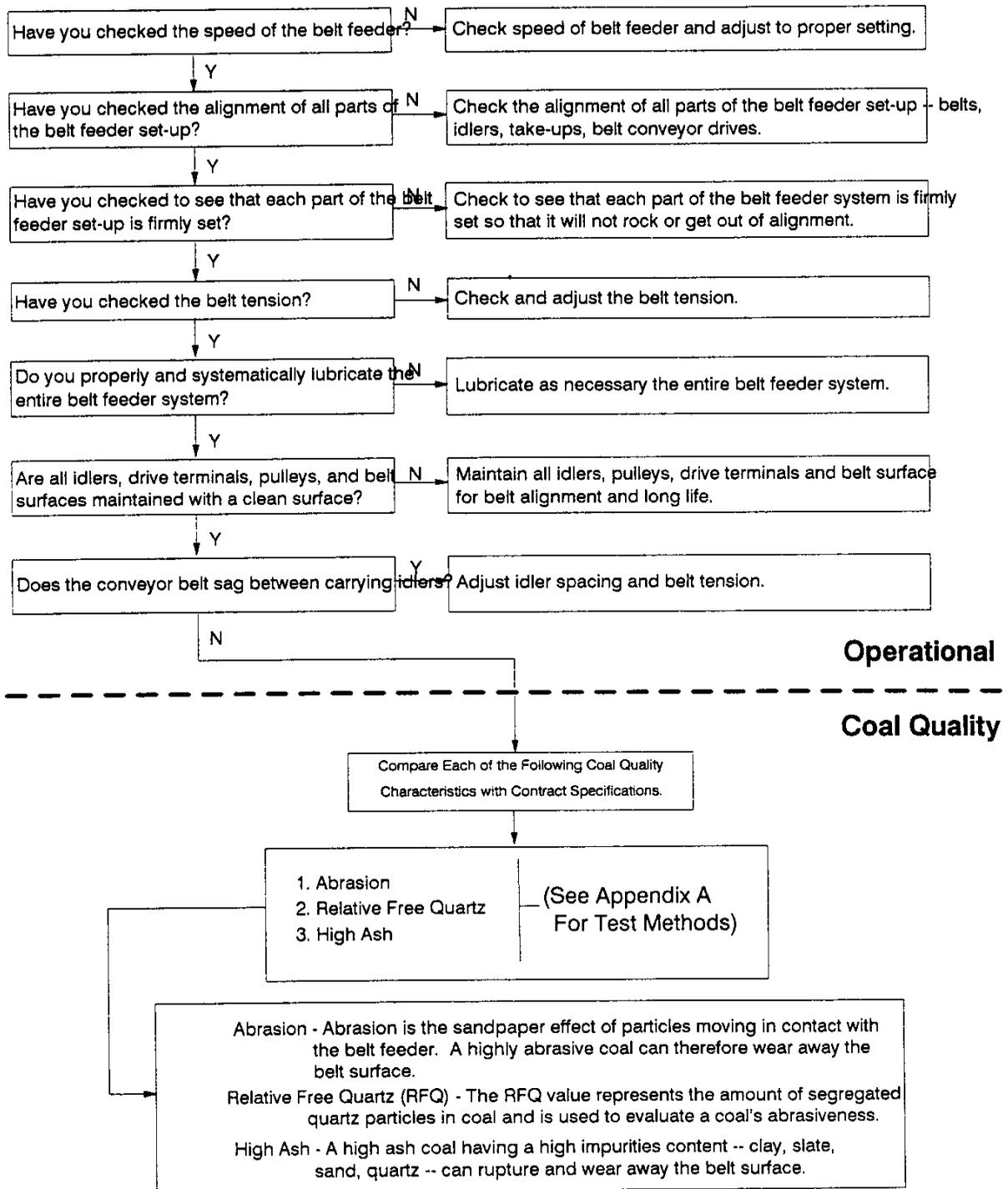
Figure 2-6. Spreader stoker—component symptom guide (part 2).

FIGURE 2-6 (Part 3): SPREADER STOKER - COMPONENTS/SYMP TOM GUIDE

COMPONENT	EXCESS WEAR	PLUGGAGE/SYMP TOM	INSUFFICIENT CAPACITY	ERRATIC FEEDING	CORROSION	SEGREGATION	PRESSURE DROP	UNEVEN ASH BED	UNEVEN COAL BED	UNEVEN BURNING	WARPED, BURNT, CRACKED	CLINKERS	CARBON BURNOU T	REDUCED EFFICIENCY	SMOKING	EROSION	SLAGGING/S PALLING	FOULING	EXCESS PARTICULATE EMISSIONS	SO ₂ EMISSIONS
FANS																				
1) Forced Draft		2-77													2-78					
2) Induced Draft		2-79		2-80											2-81	2-82				
PARTICULATE REMOVAL																				
1) Baghouse													2-83							2-84
2) Cyclone													2-85		2-86					2-87
3) Electrostatic Precipitator													2-88		2-89					2-90
ASH HANDLING																				
1) Fly Ash Recycle															2-91					
2) Ash Hopper/Pit													2-92	2-93						
Stack/Chimney				2-94									2-95	2-96						2-97

Figure 2-6. Spreader stoker—component symptom guide (part 3).

**FIGURE 2-7: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Automatic Coal Reclaim
(Belt Feeder)**



**FIGURE 2-8: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Automatic Coal Reclaim
(Belt Feeder)**

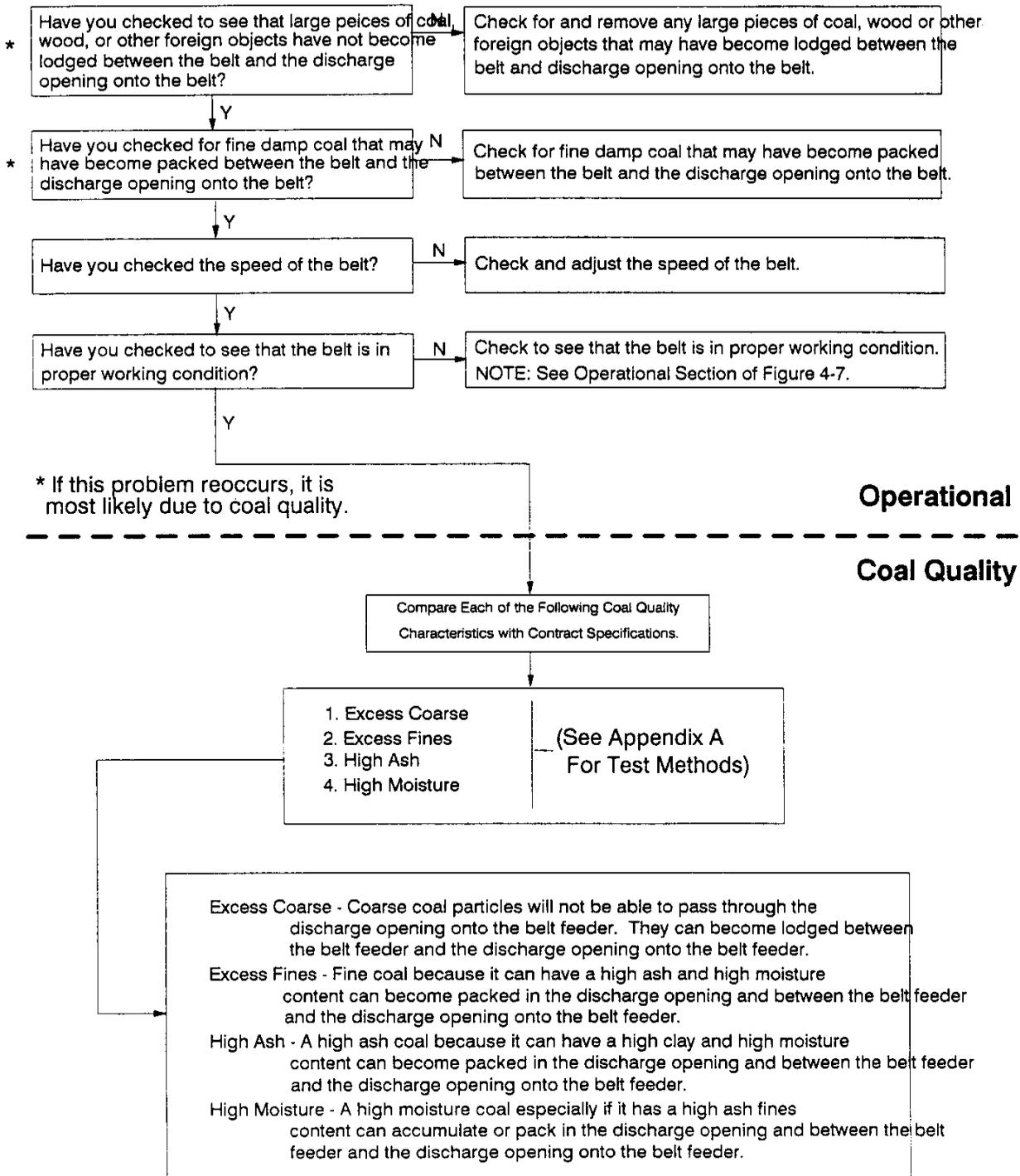
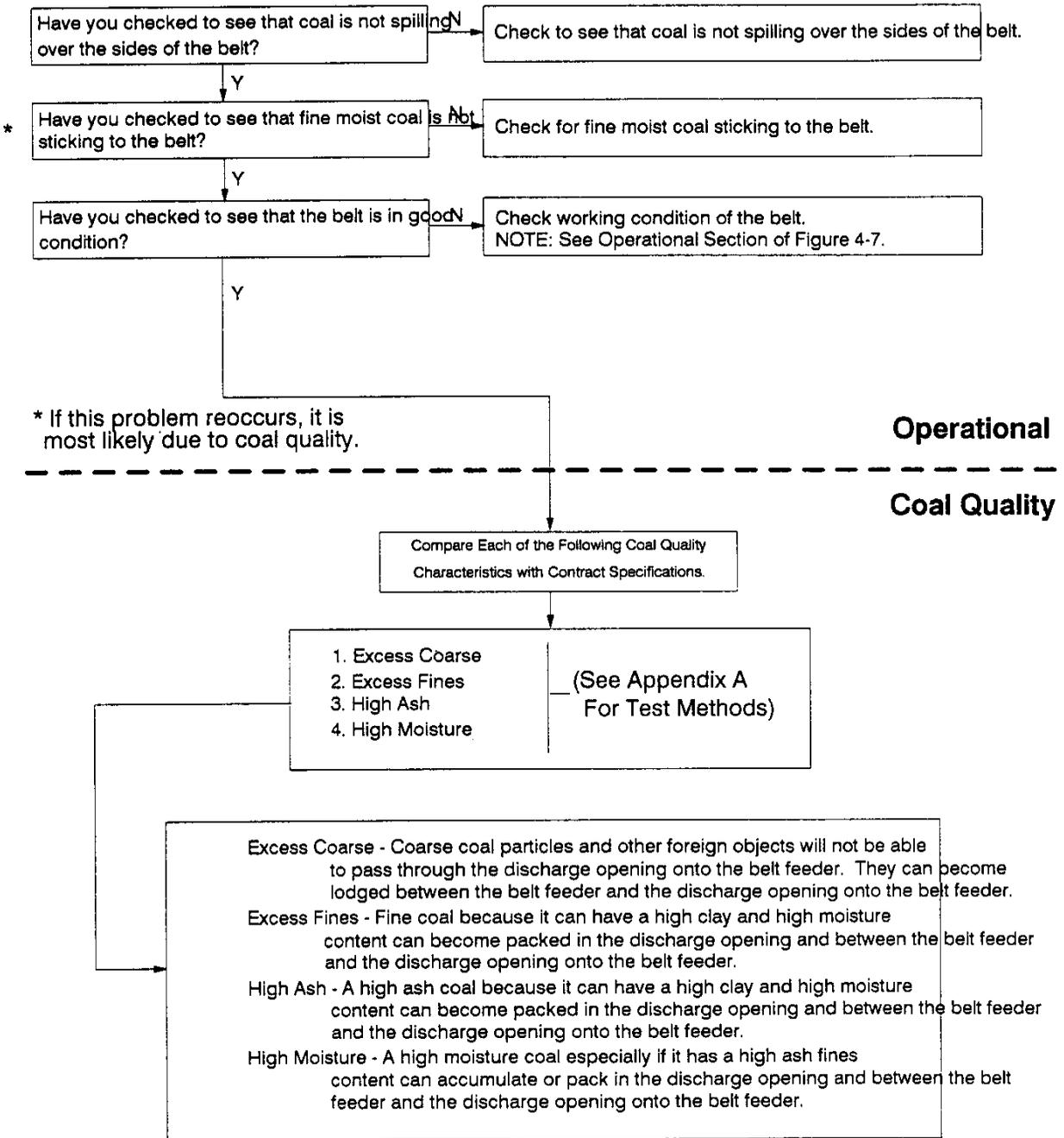
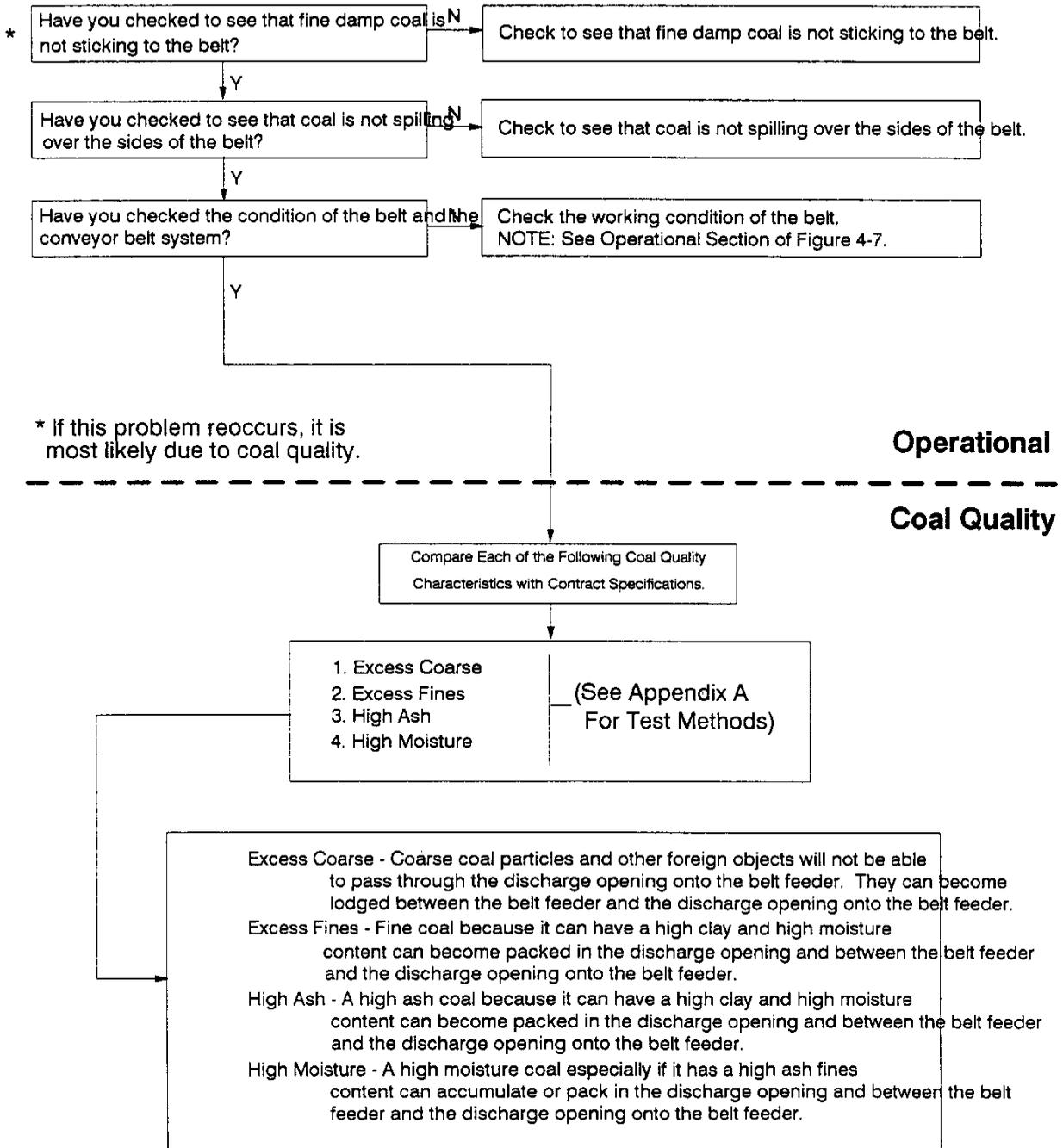


FIG2-8n/1

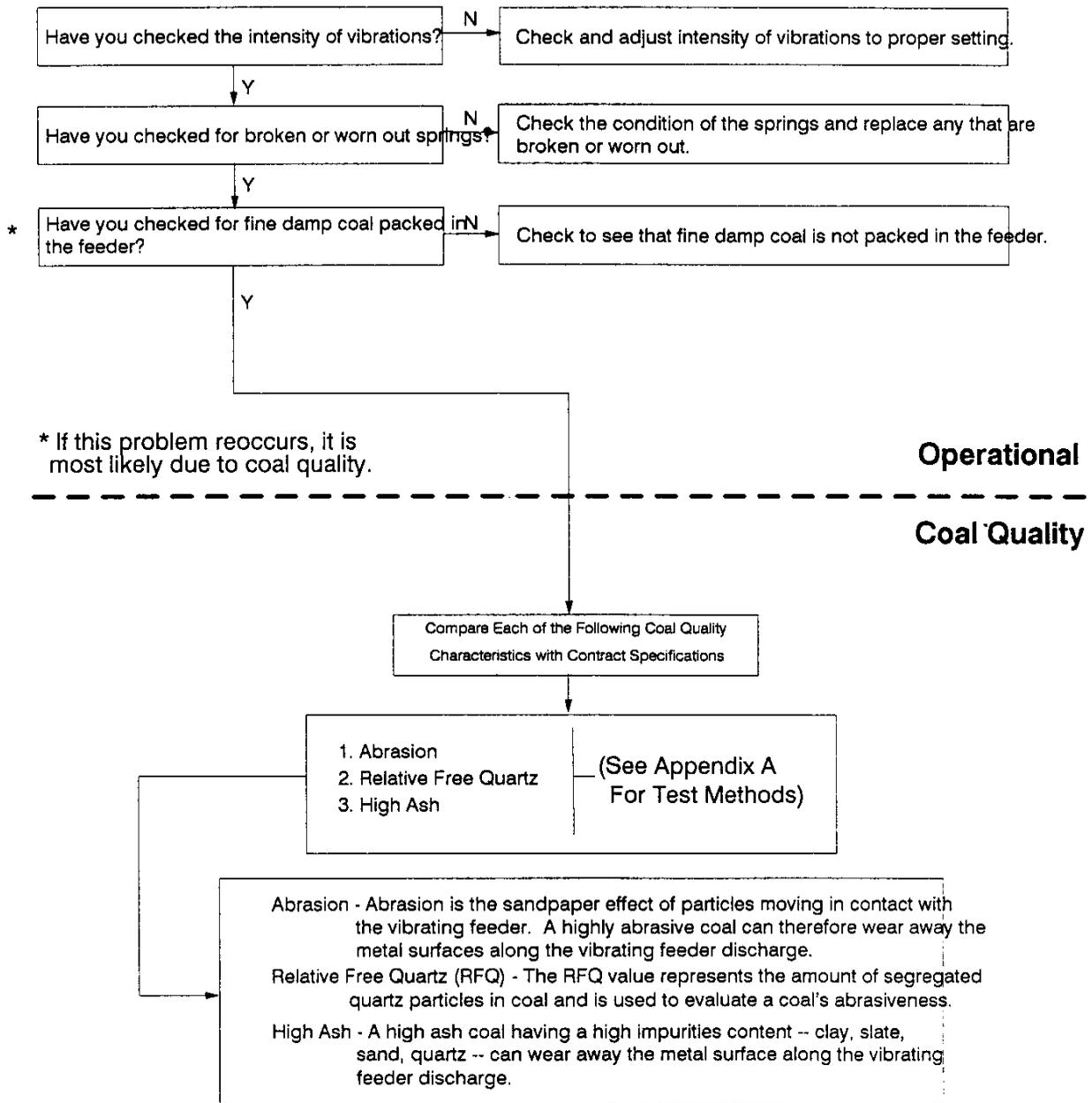
**FIGURE 2-9: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Automatic Coal Reclaim
(Belt Feeder)**



**FIGURE 2-10: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Automatic Coal Reclaim
(Belt Feeder)**



**FIGURE 2-11: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Automatic Coal Reclaim
(Vibrating Feeder)**



**FIGURE 2-12: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Automatic Coal Reclaim
(Vibrating Feeder)**

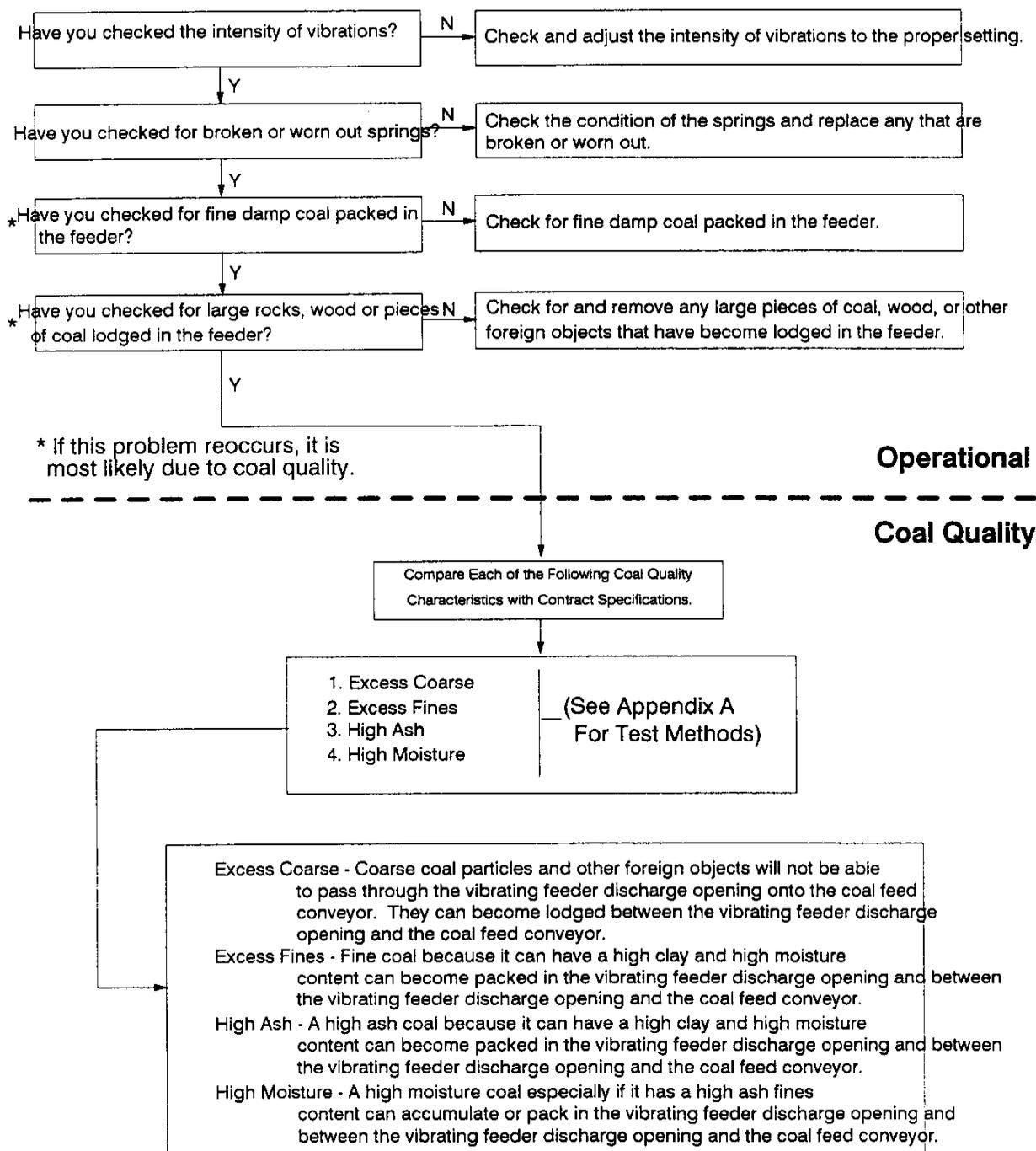


FIG2-12n/1

**FIGURE 2-13: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Automatic Coal Reclaim
(Vibrating Feeder)**

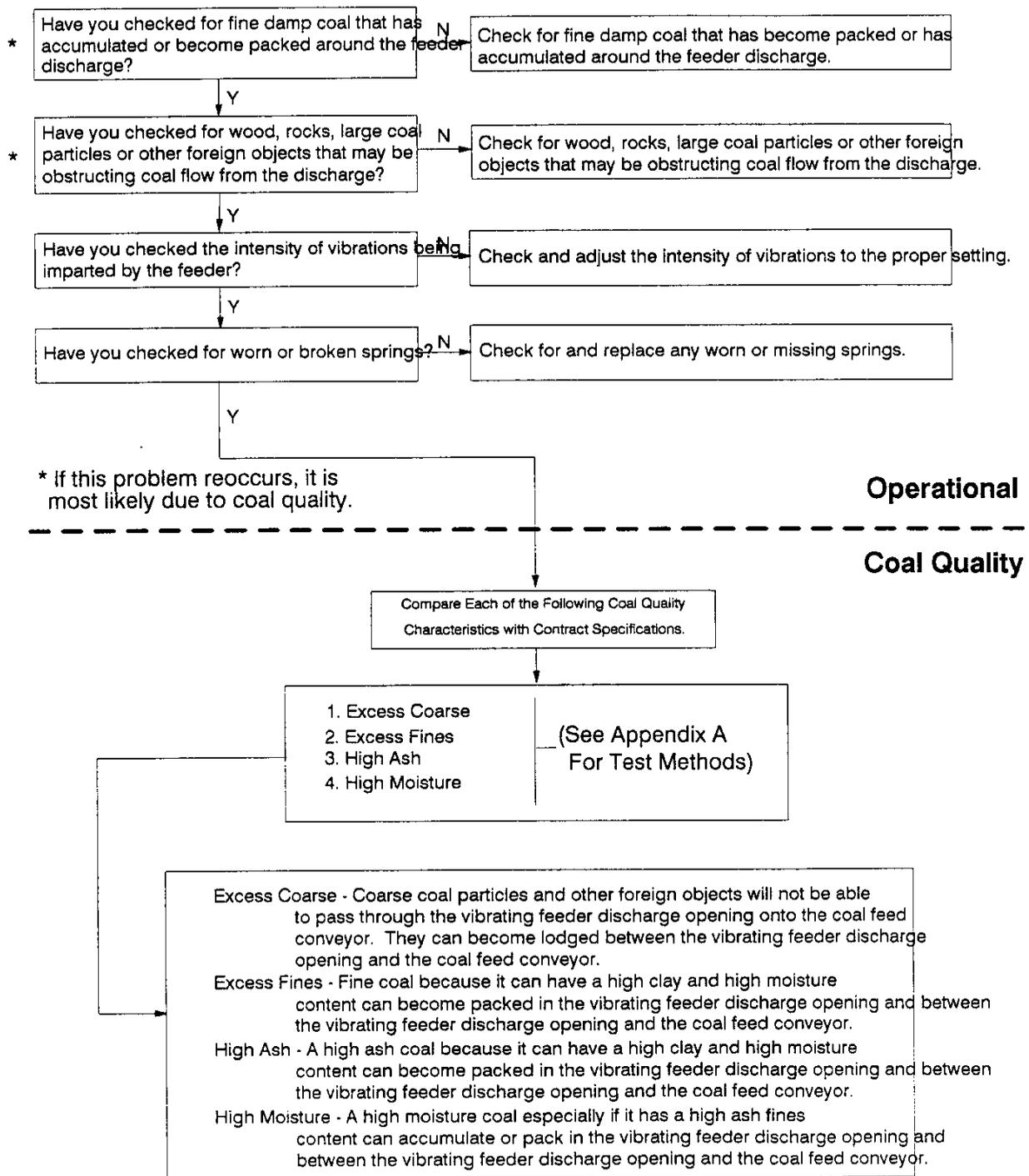


FIG2-13v1

**FIGURE 2-14: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Automatic Coal Reclaim
(Vibrating Feeder)**

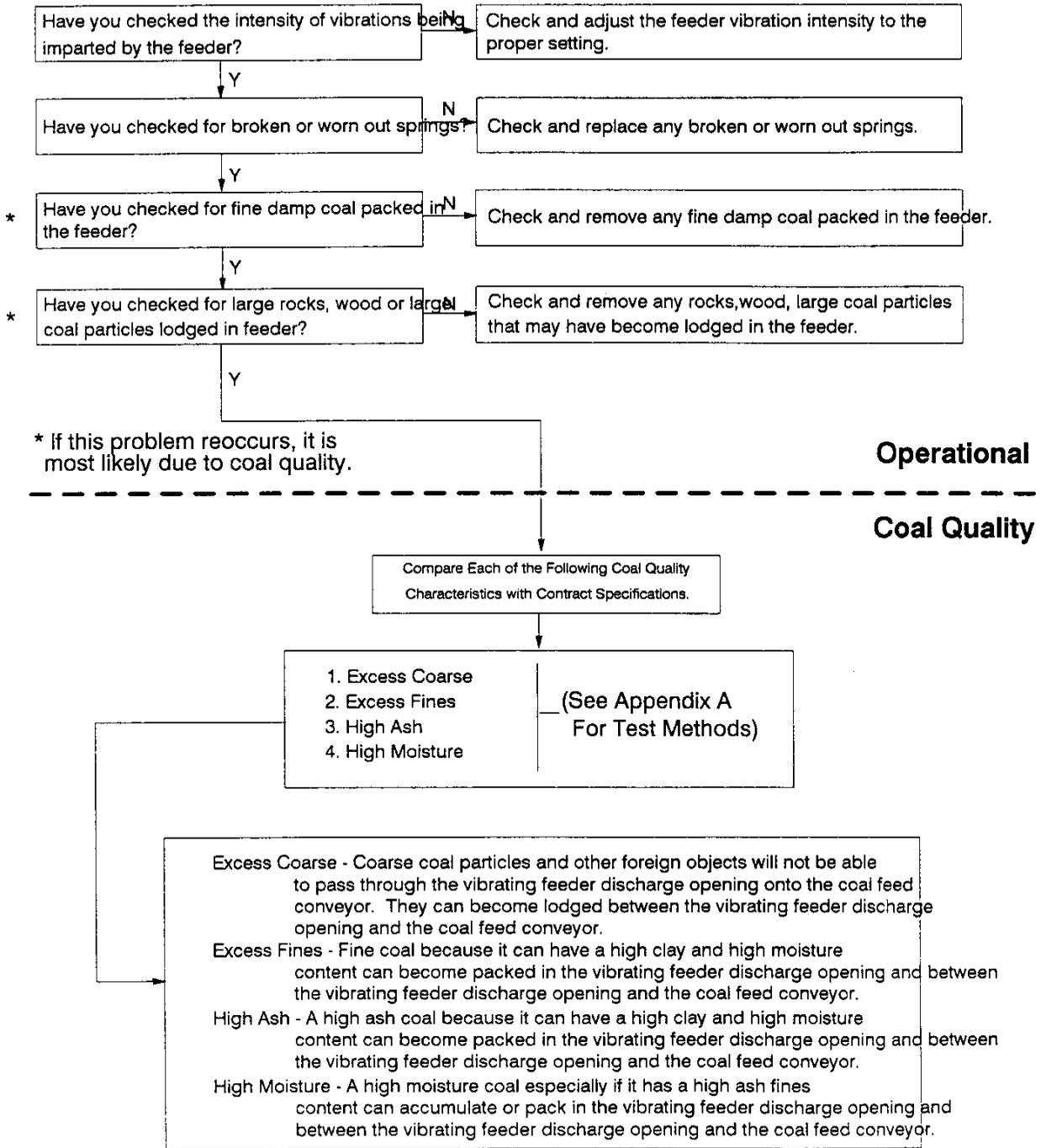
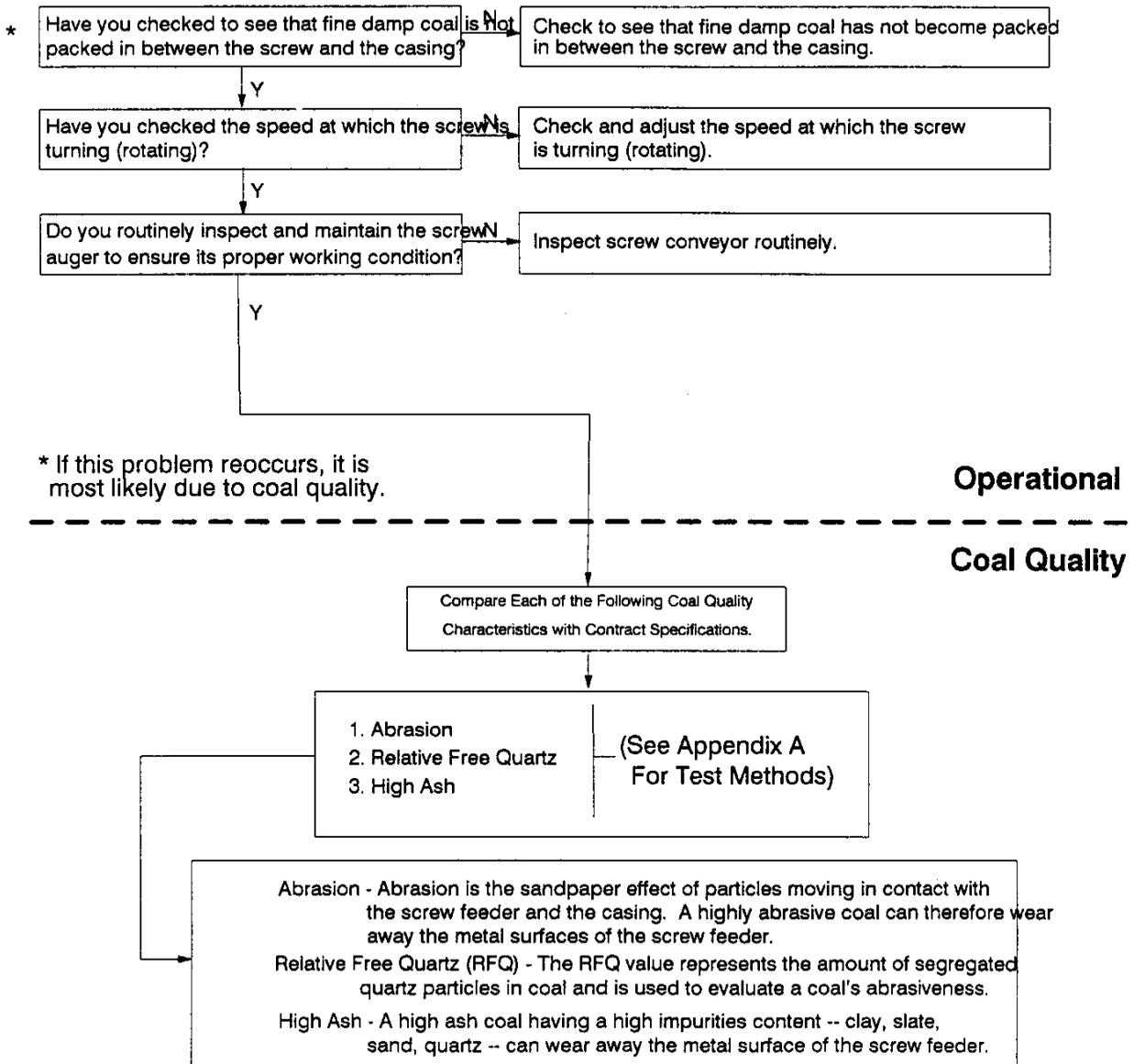
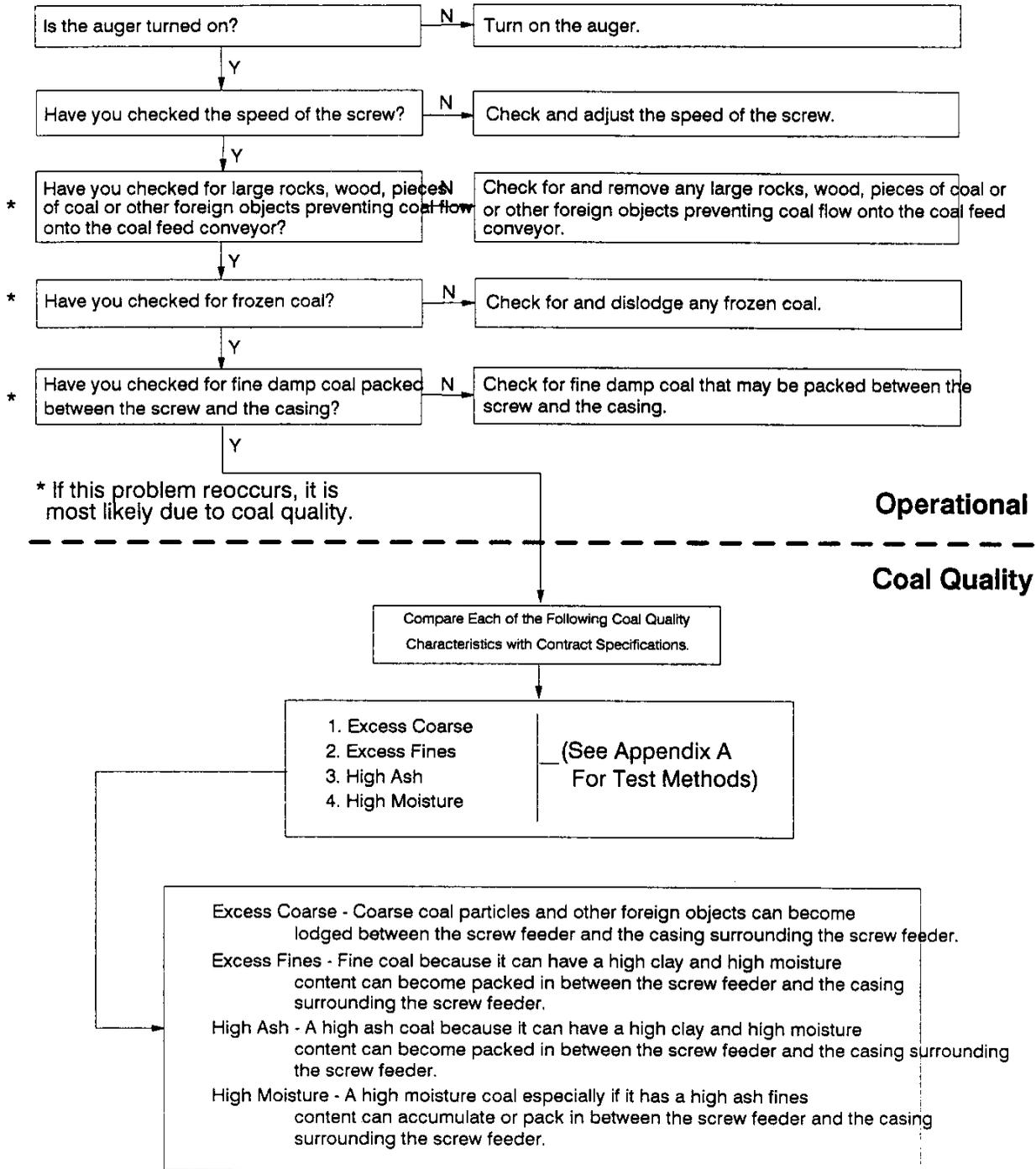


FIG2-14v1

**FIGURE 2-15: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Automatic Coal Reclaim
(Screw Feeder)**



**FIGURE 2-16: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Automatic Coal Reclaim
(Screw Feeder)**



**FIGURE 2-17: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Automatic Coal Reclaim
(Screw Feeder)**

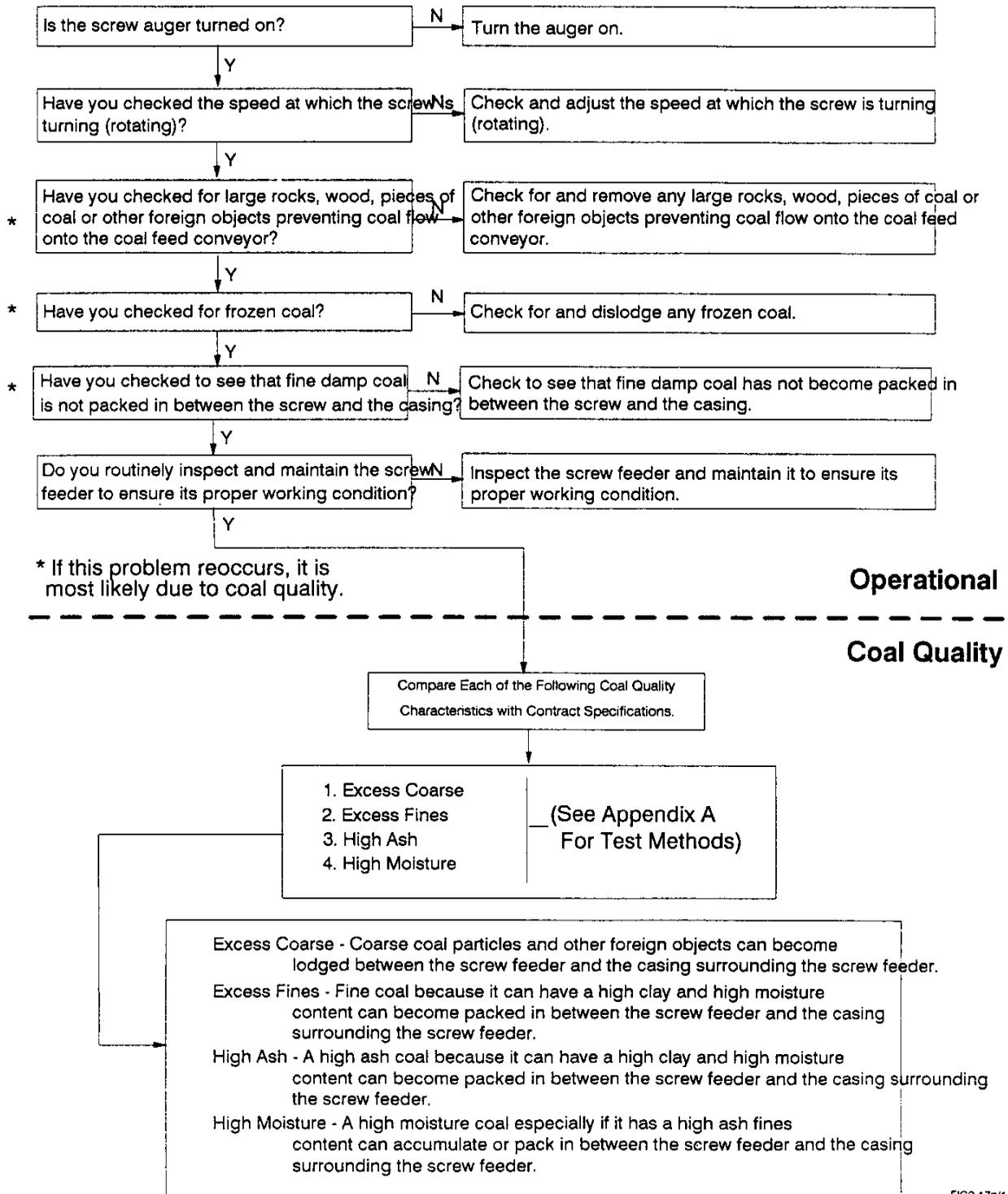


FIG2-17n/1

**FIGURE 2-18: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feed From The Automatic Coal Reclaim
(Screw Feeder)**

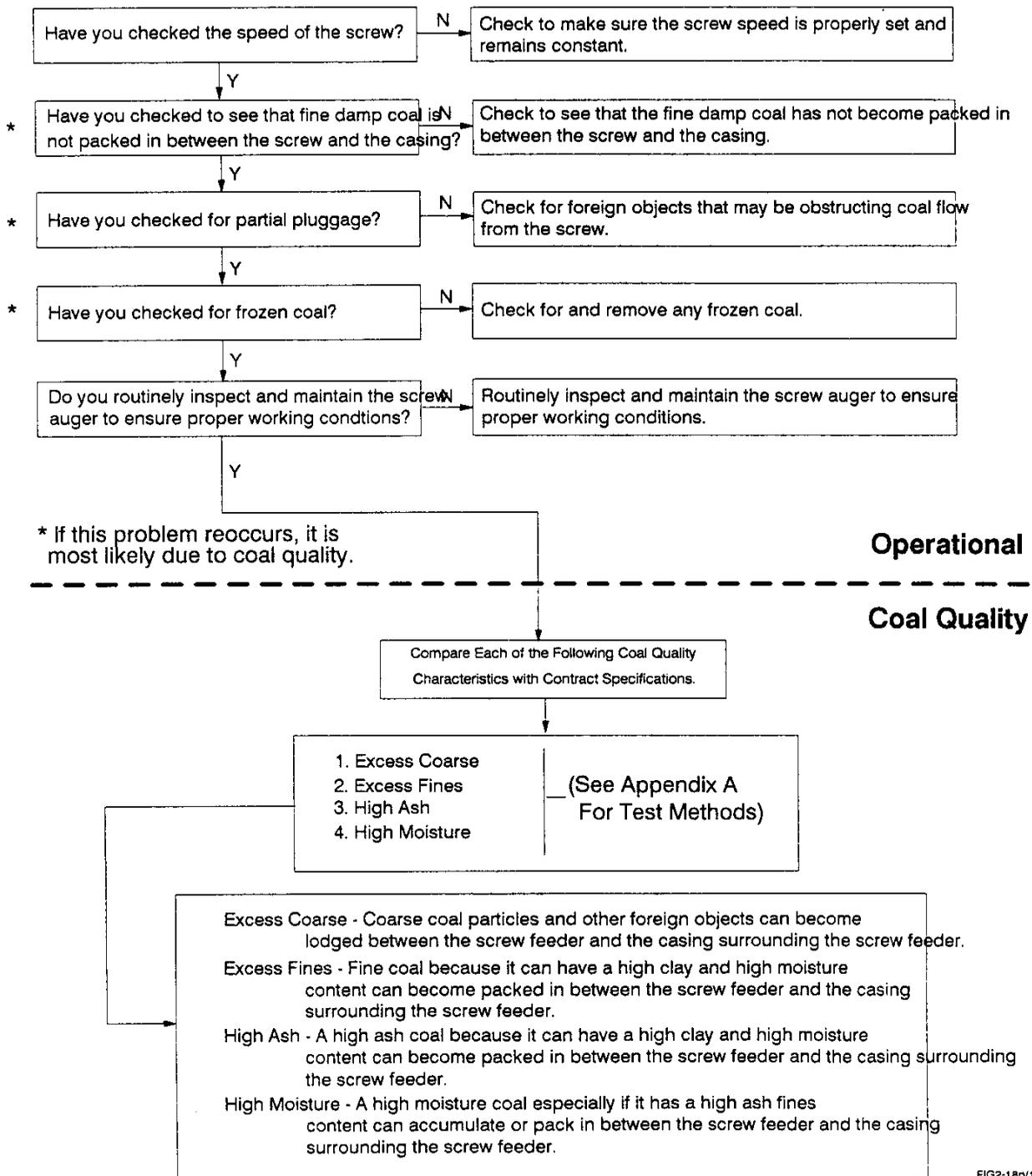
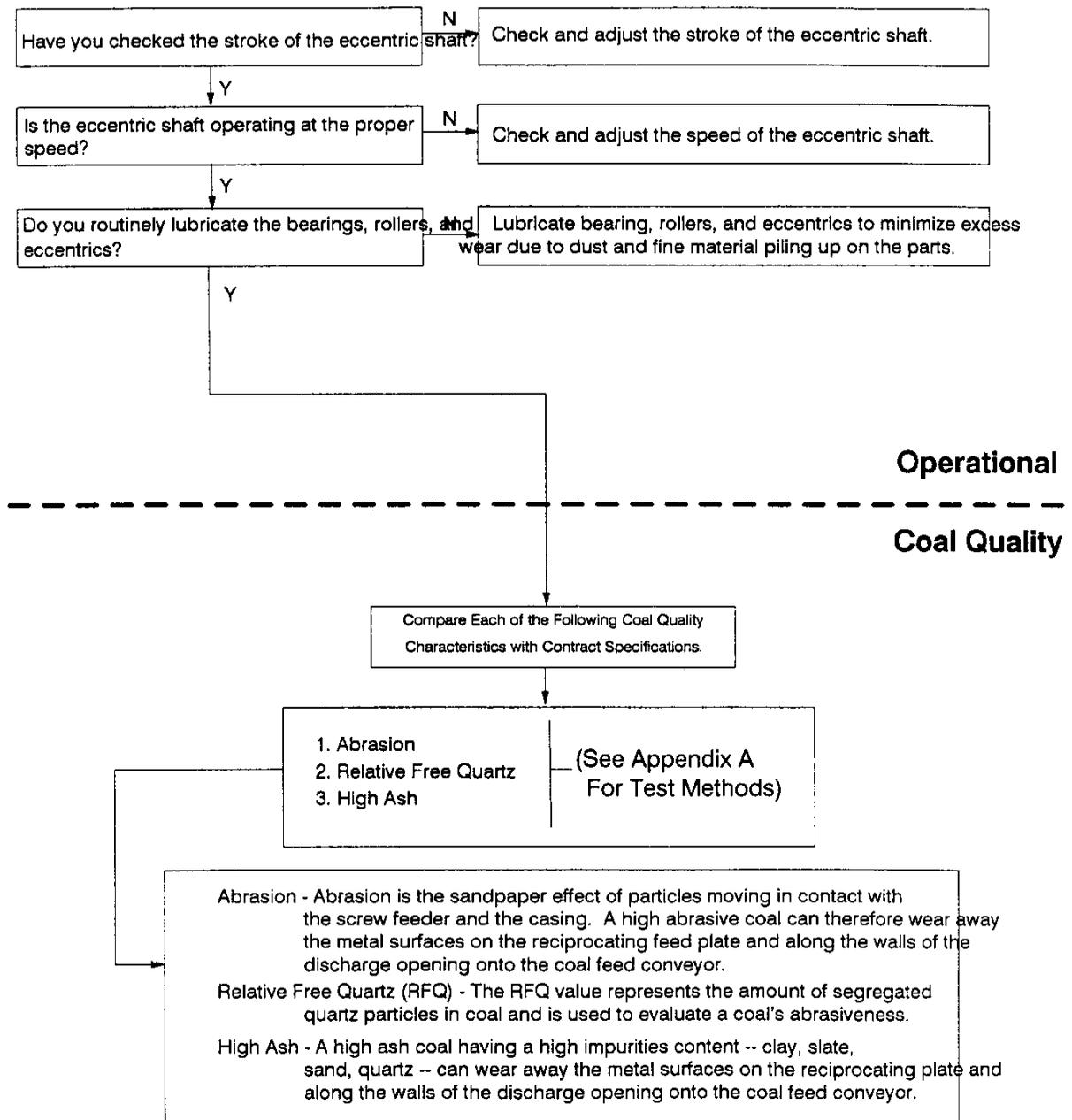


FIG2-18/v1

**FIGURE 2-19: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Automatic Coal Reclaim
(Reciprocating Feeder)**



**FIGURE 2-20: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Automatic Coal Reclaim
(Reciprocating Feeder)**

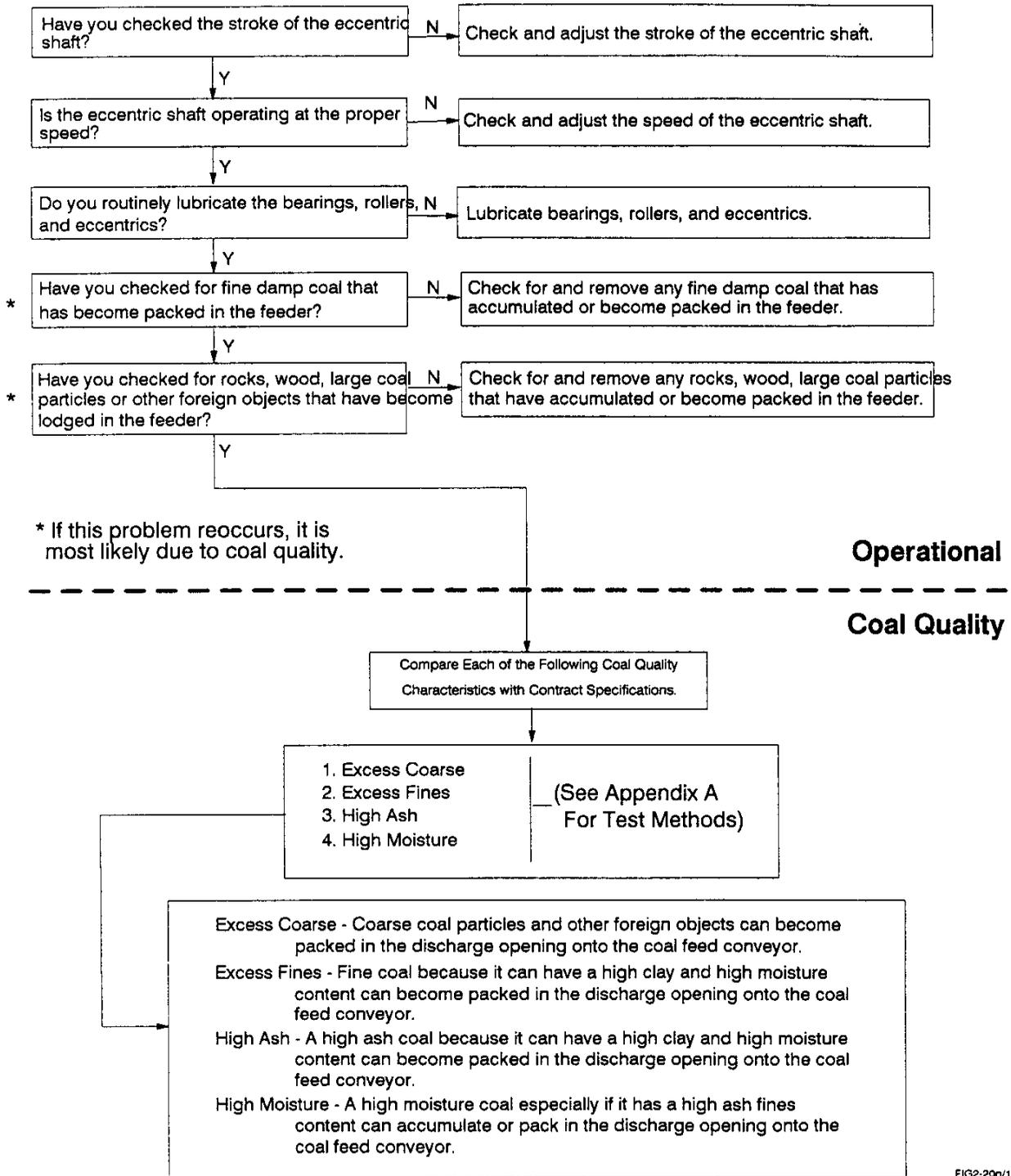


FIG2-20r/1

**FIGURE 2-21: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Automatic Coal Reclaim
(Reciprocating Feeder)**

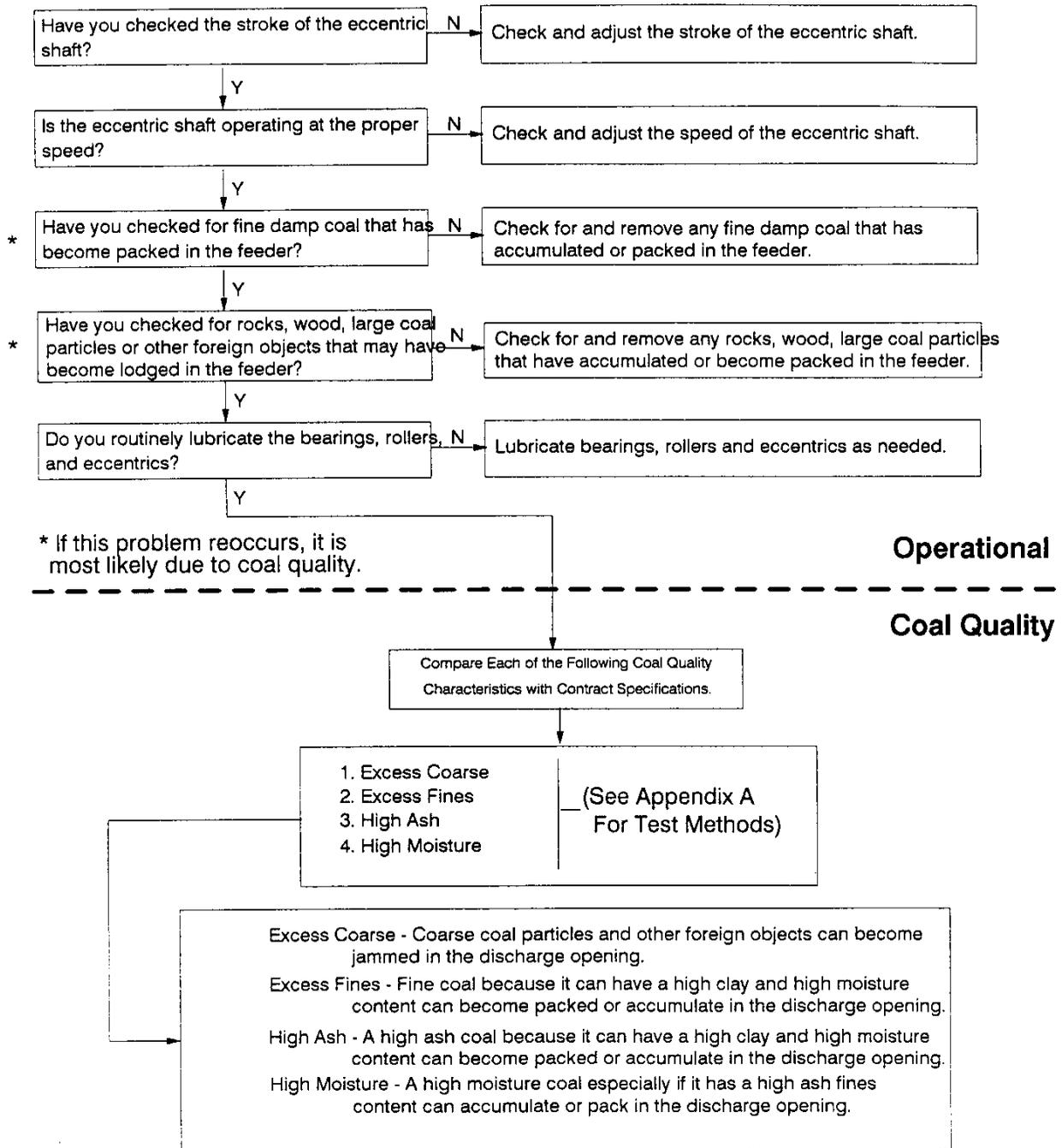


FIG2-21a/1

**FIGURE 2-22: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Automatic Coal Reclaim
(Reciprocating Feeder)**

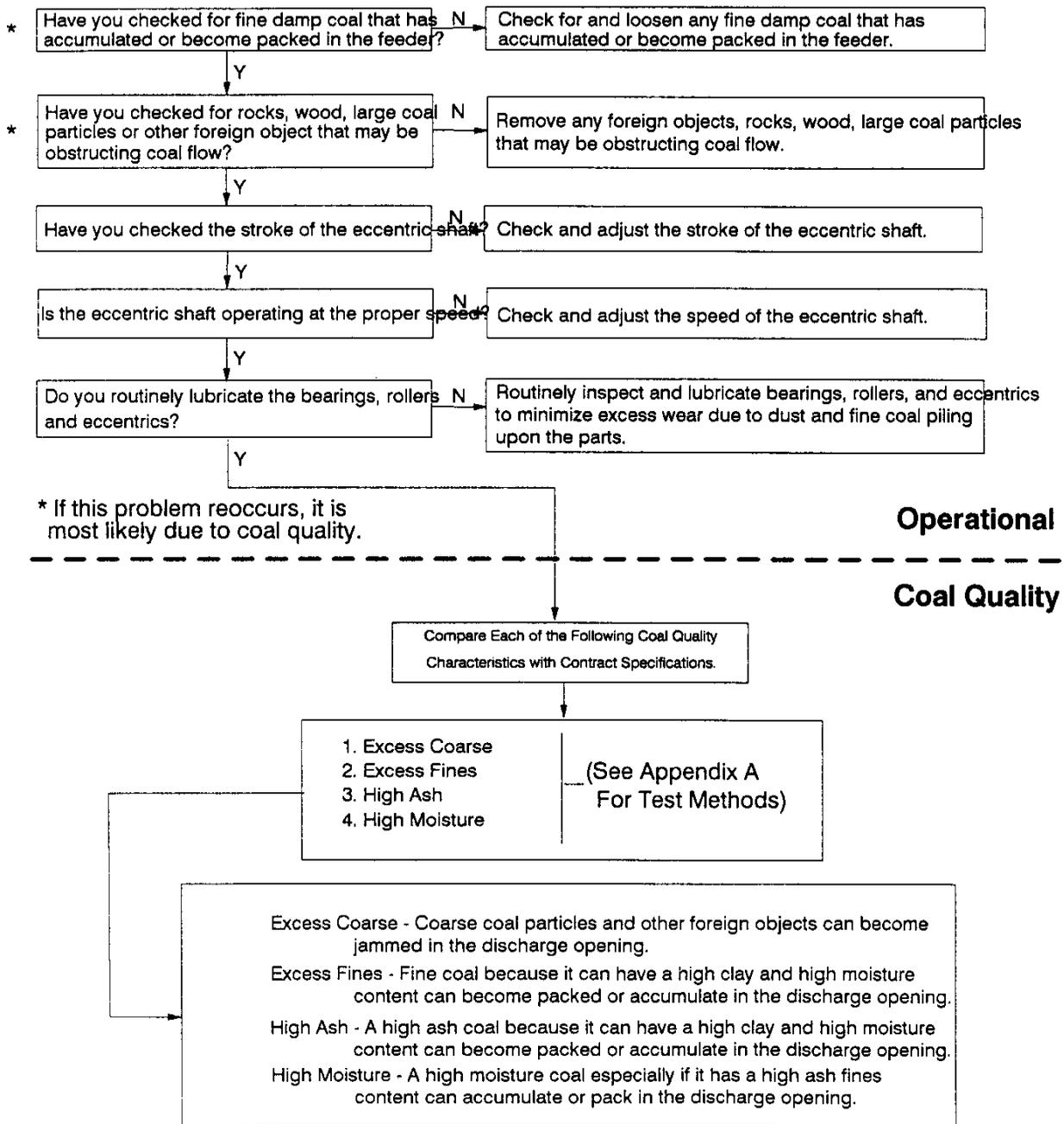


FIG2-22n/1

**FIGURE 2-23: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Coal Feed Conveyor
(Belt Conveyor)**

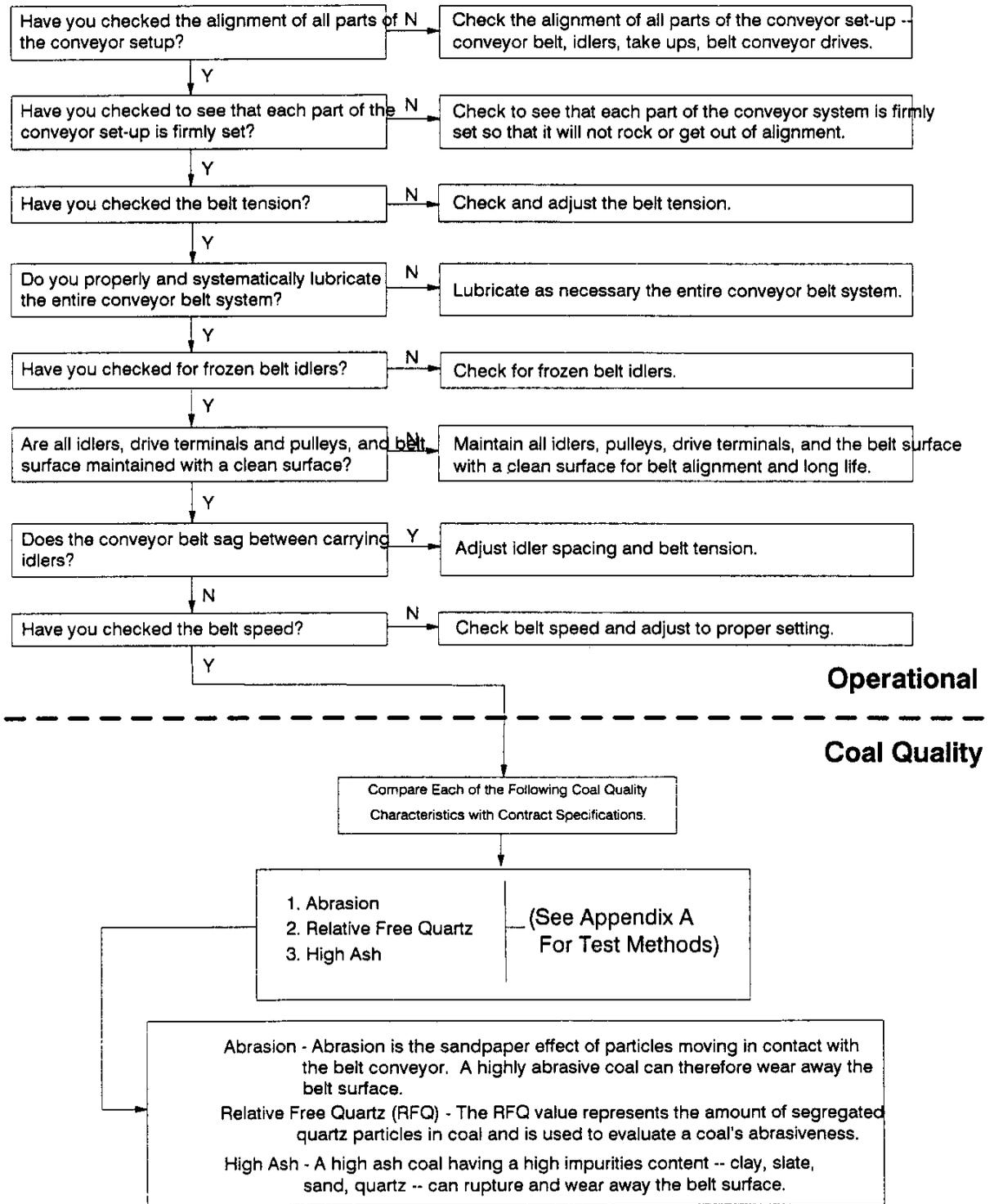


FIG2-23n/1

**FIGURE 2-24: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feed Conveyor
(Belt Conveyor)**

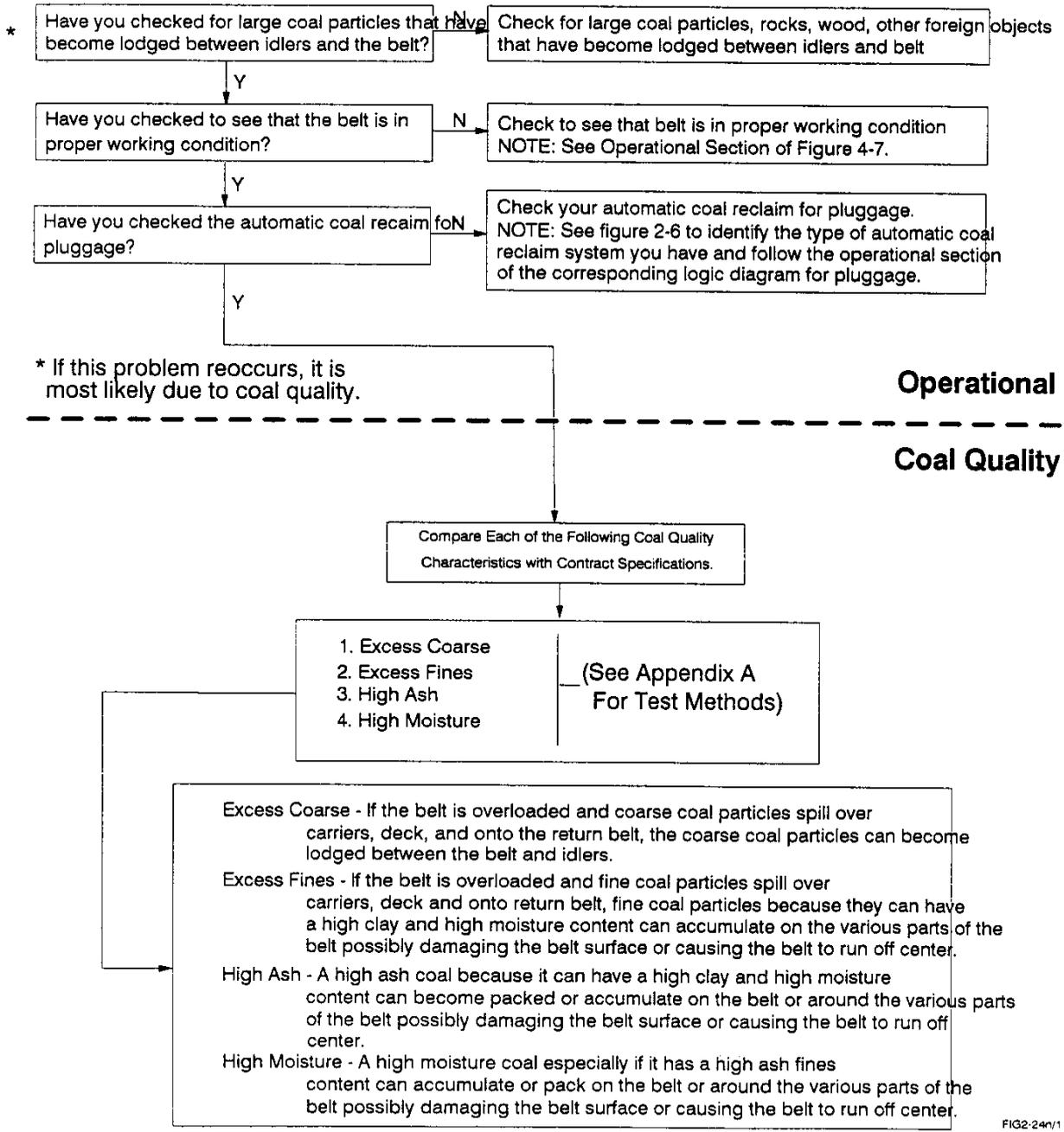
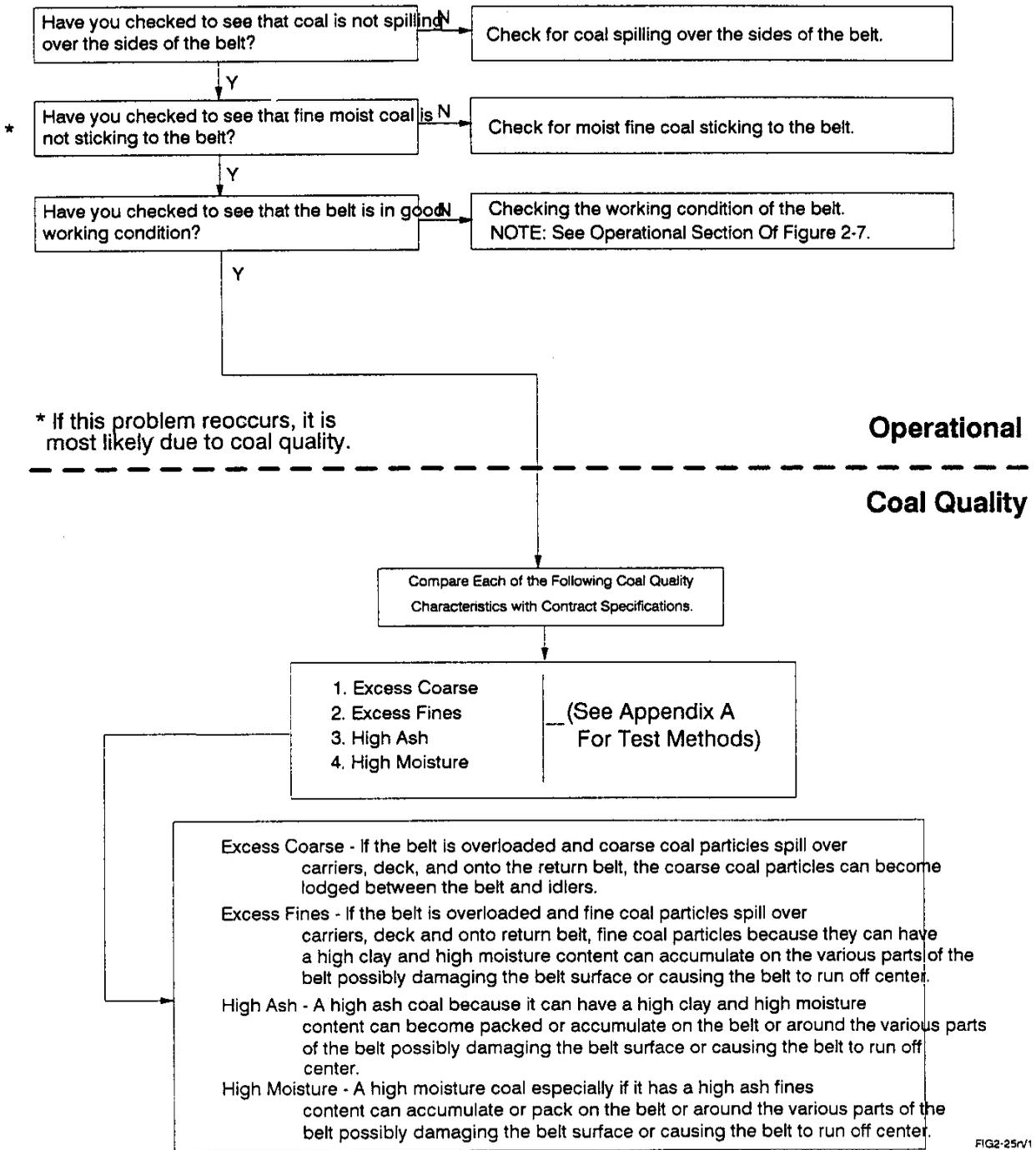


FIG2-24/1

**FIGURE 2-25: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Coal Feed Conveyor
(Belt Conveyor)**



**FIGURE 2-26: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Feed Conveyor
(Belt Conveyor)**

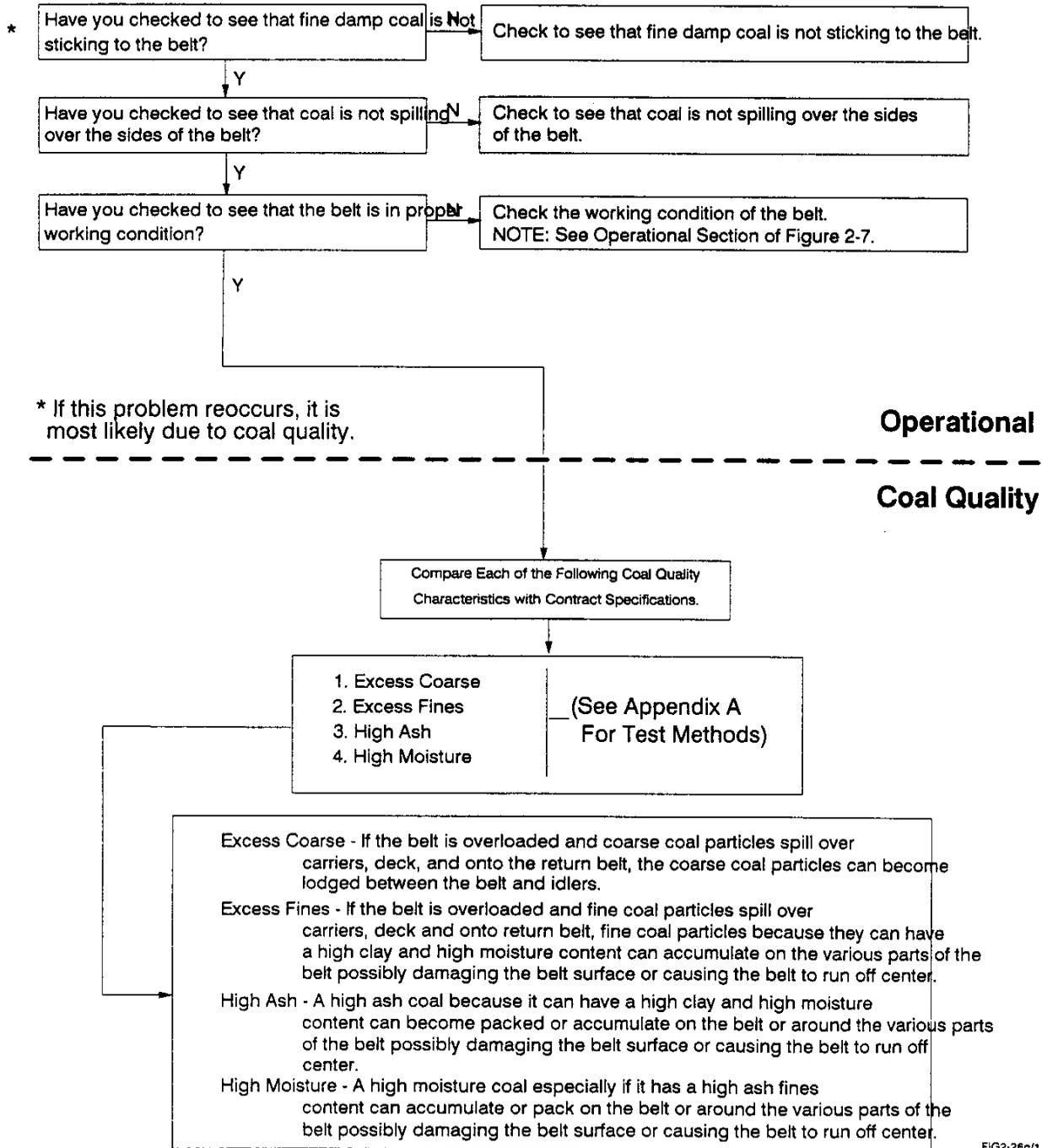
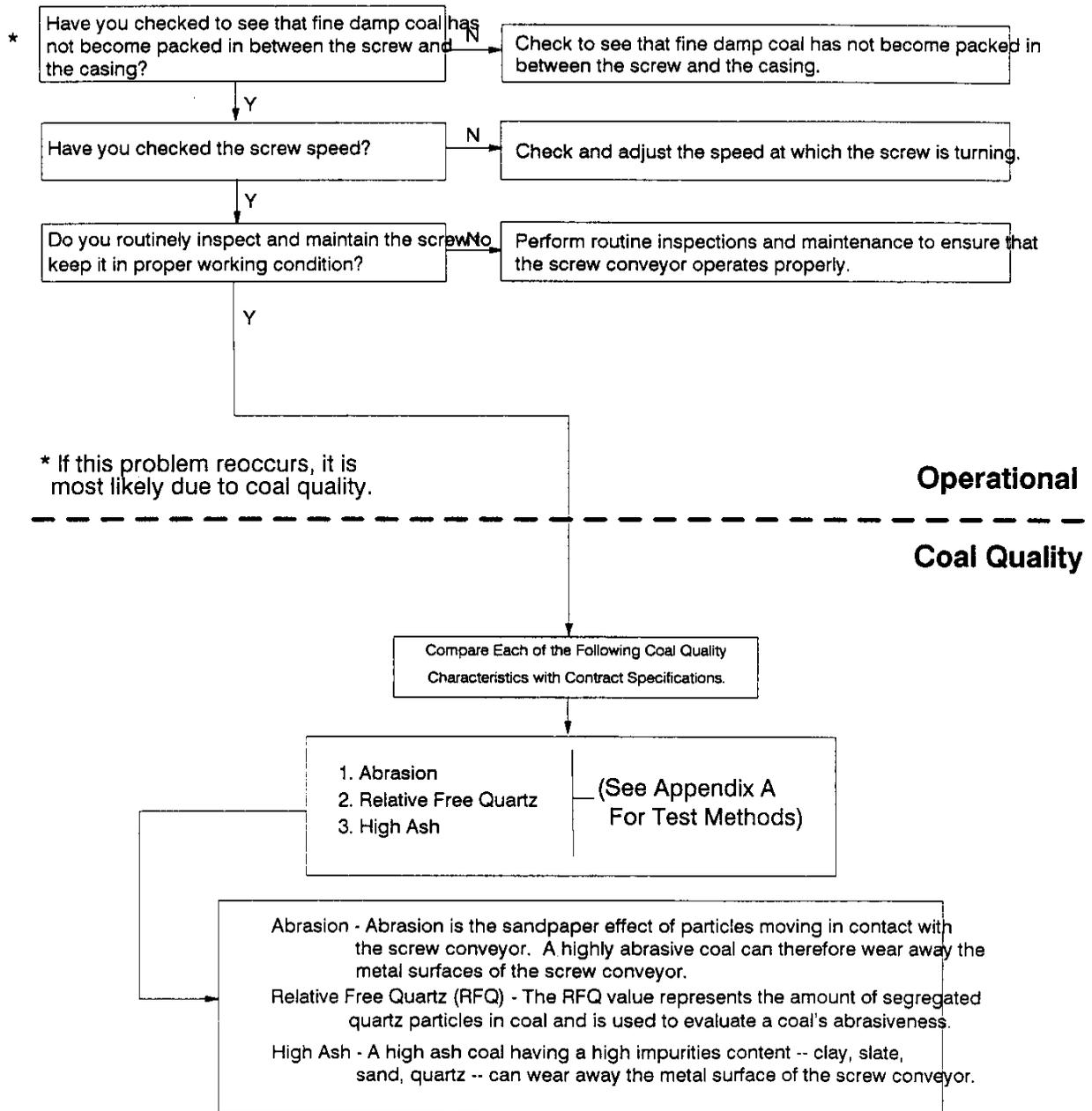
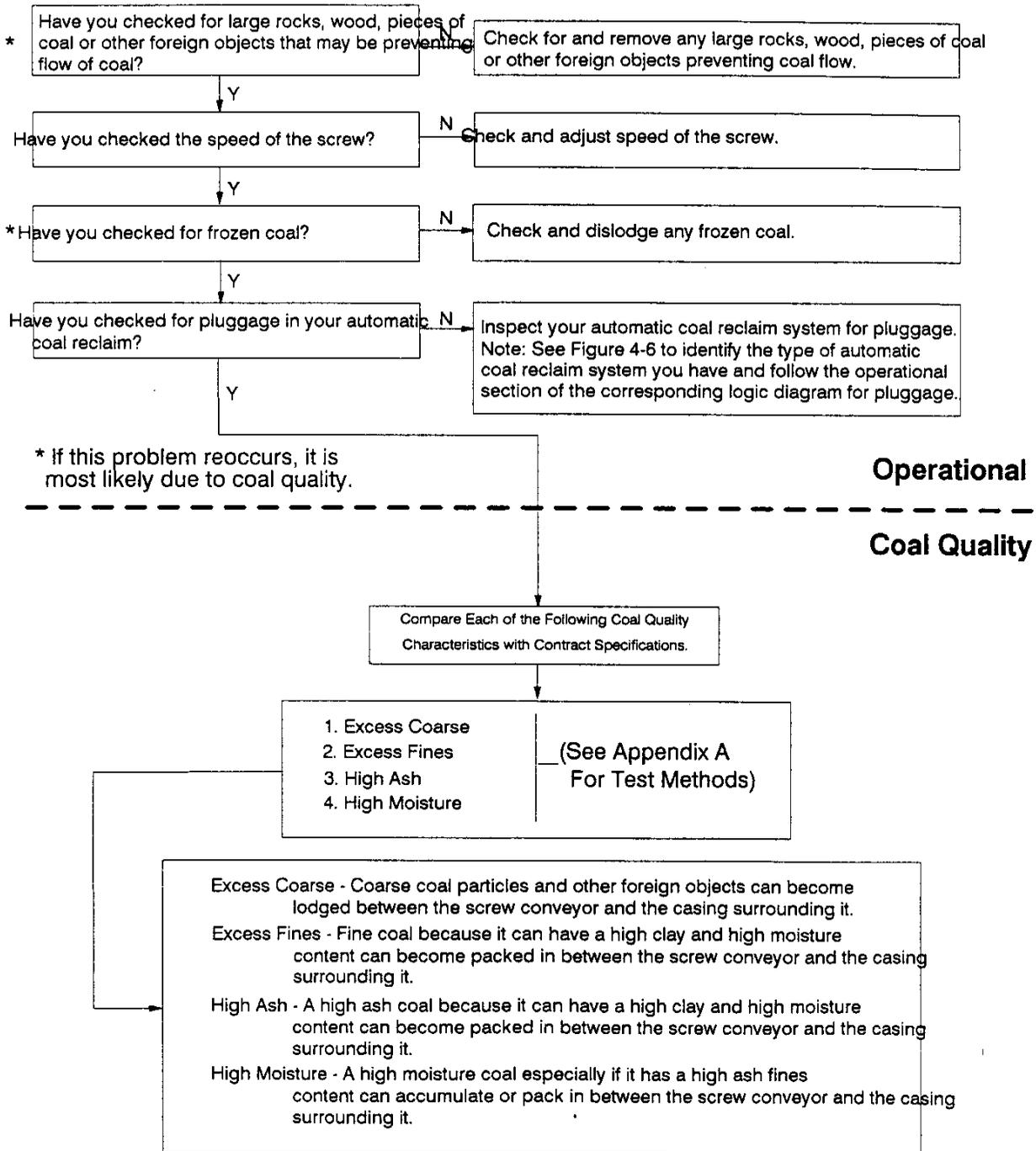


FIG2-26n/1

**FIGURE 2-27: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
for Excess Wear In The Coal Feed Conveyor
(Screw Conveyor)**



**FIGURE 2-28: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feed Conveyor
(Screw Conveyor)**



**FIGURE 2-29: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Coal Feed Conveyor
(Screw Conveyor)**

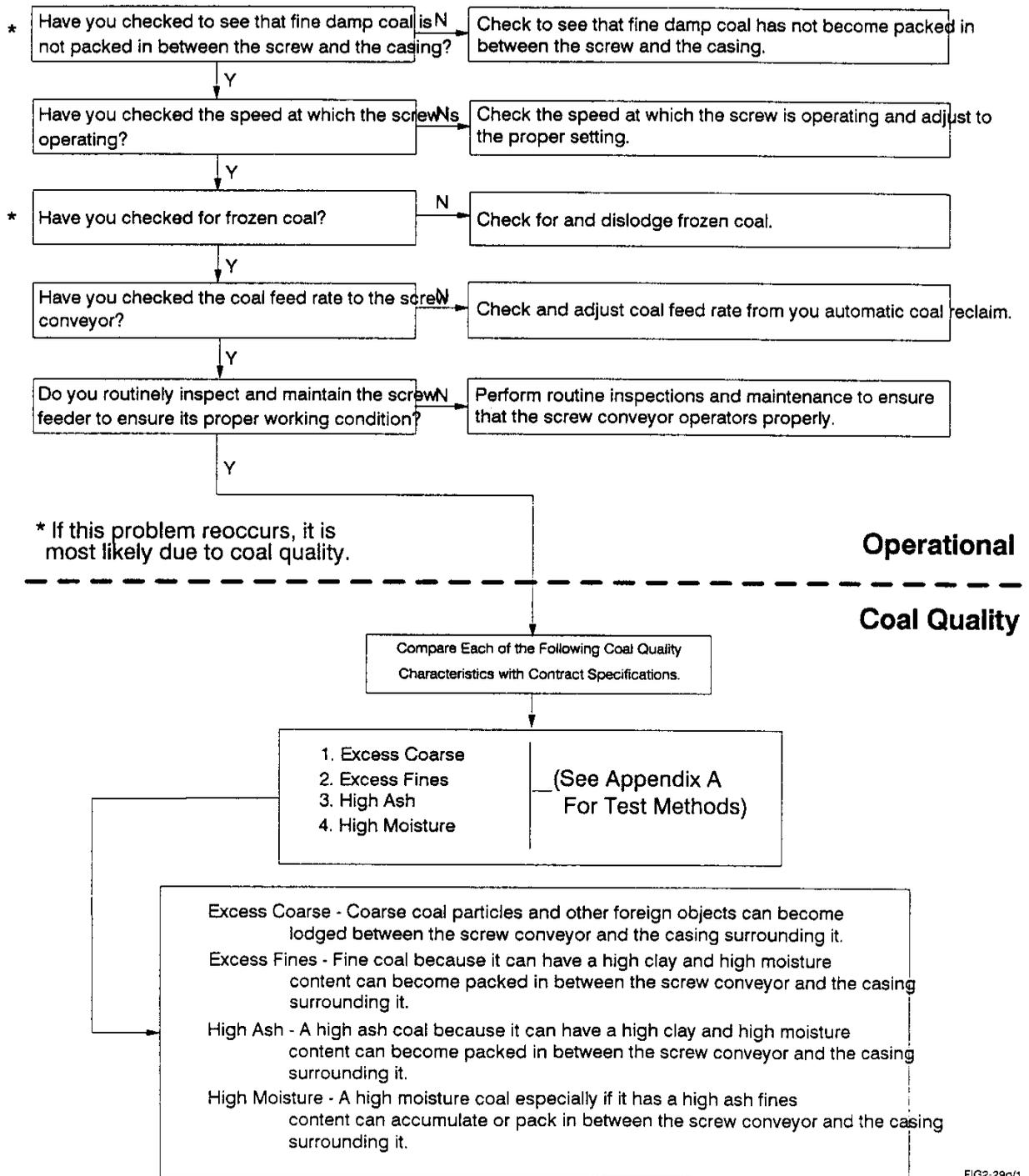


FIG2-29n/1

**FIGURE 2-30: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Feed Conveyor
(Screw Conveyor)**

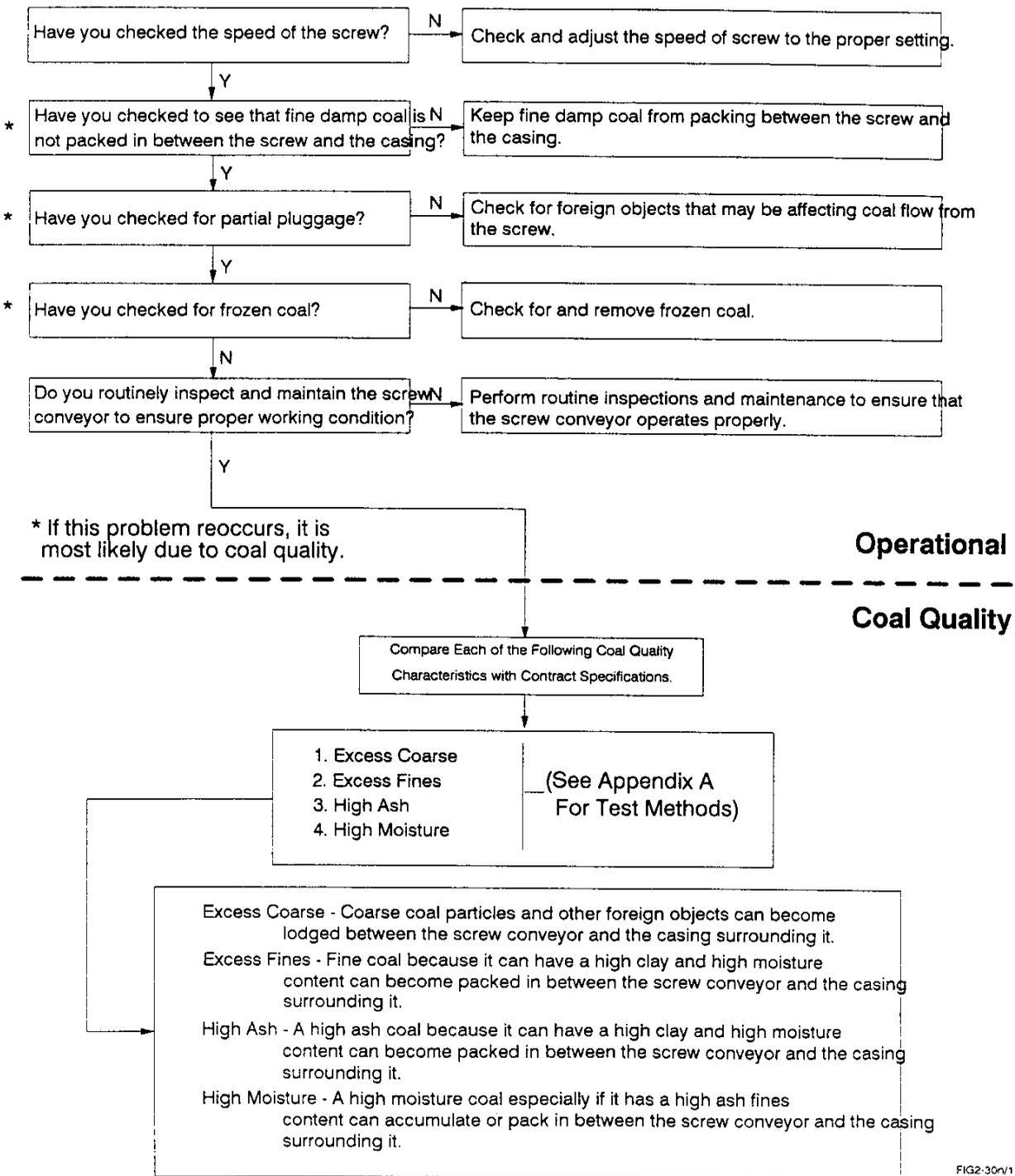


FIG2-30v1

**FIGURE 2-31: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear In The Coal Feed Conveyor
(Bucket Conveyor)**

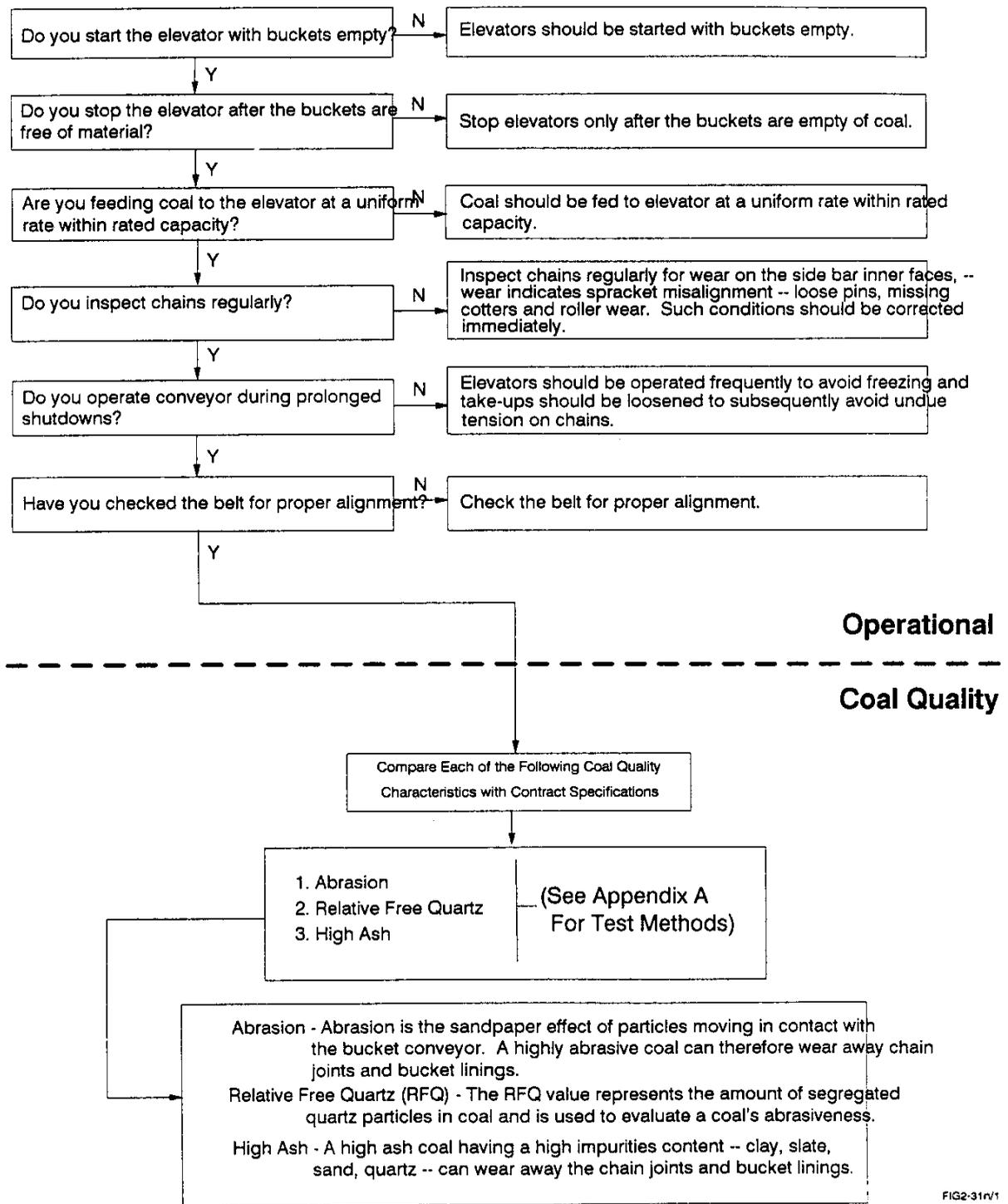


FIG2-31/V1

**FIGURE 2-32: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feed Conveyor
(Bucket Conveyor)**

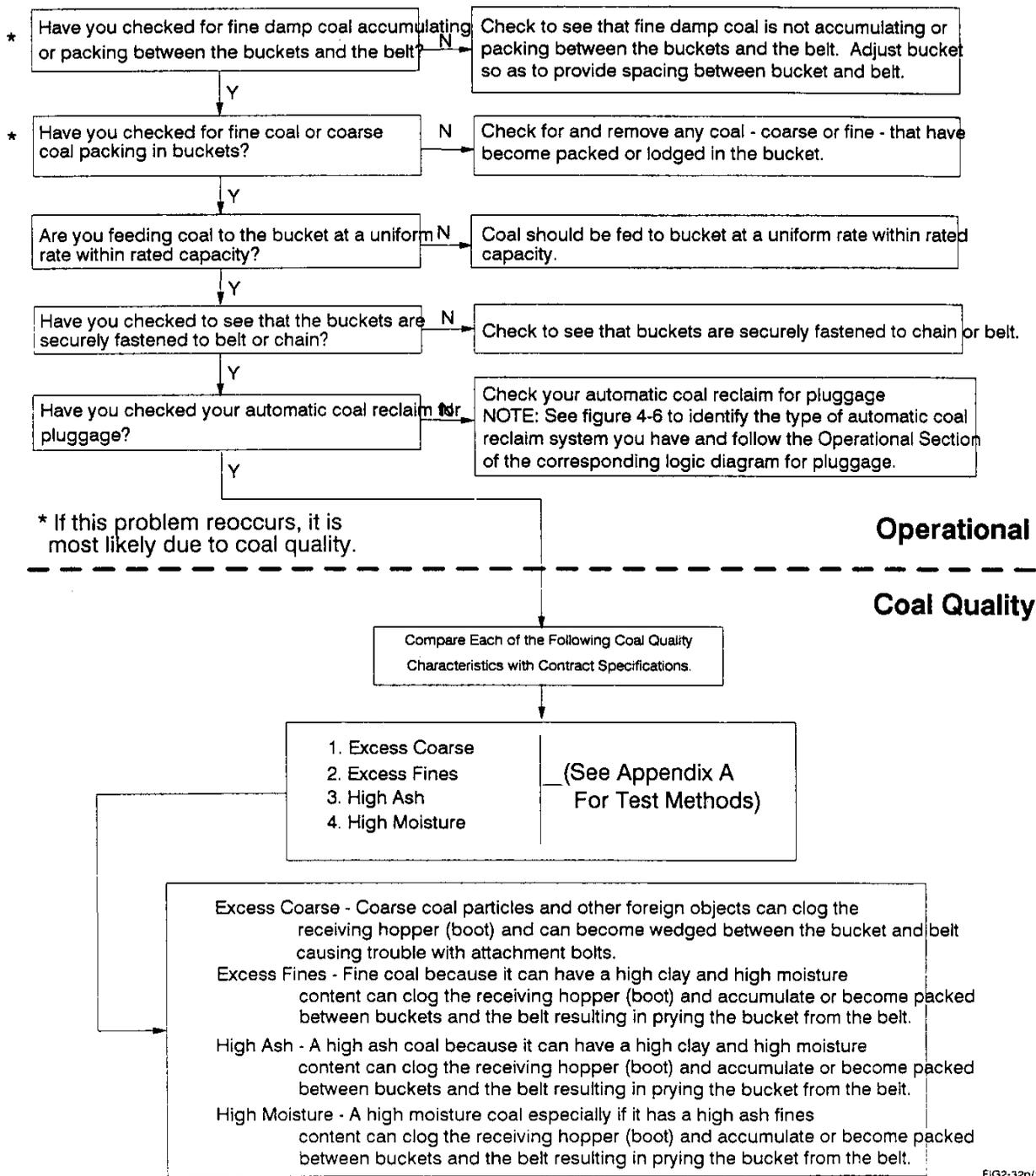
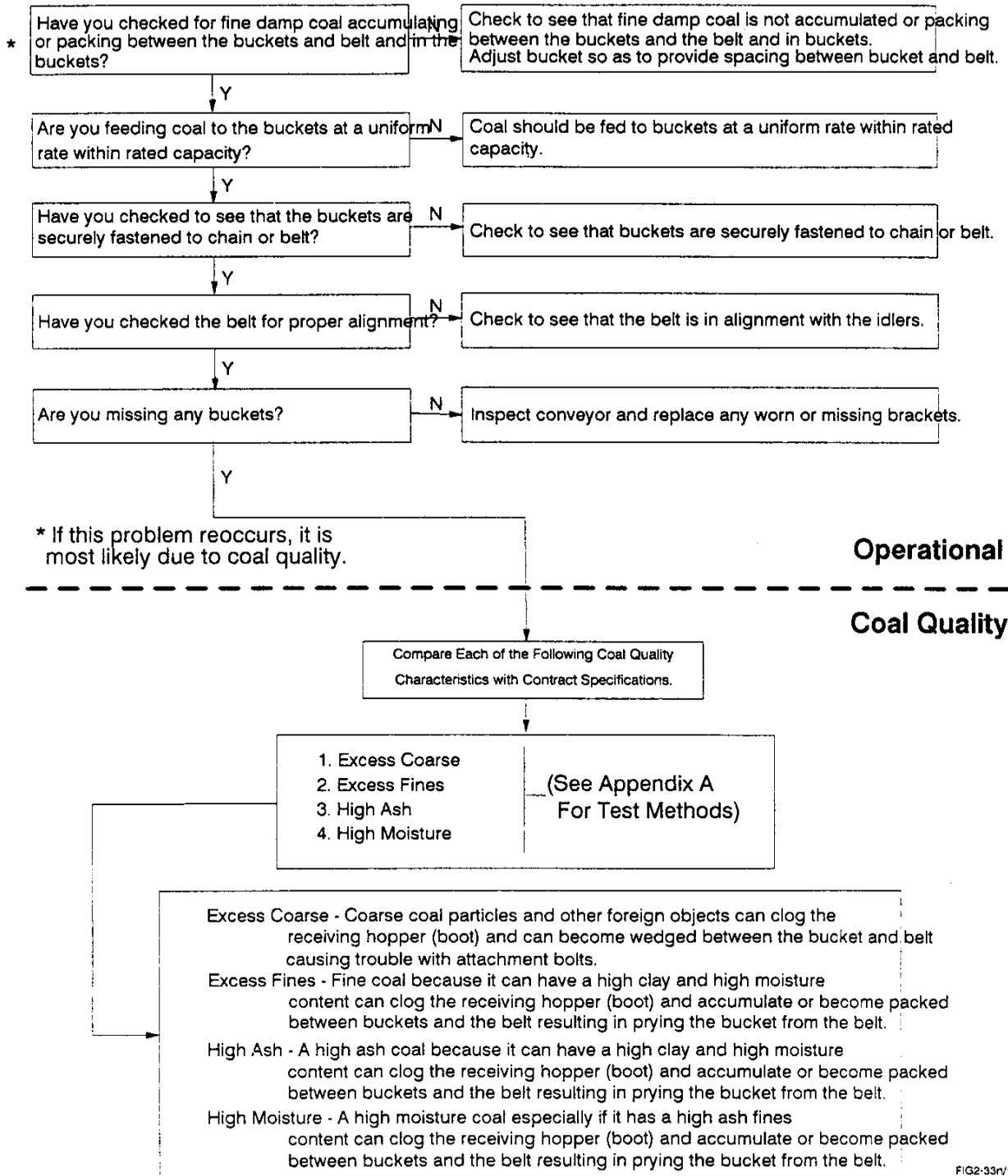


FIG2-32n/1

**FIGURE 2-33: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity Of The Coal Feed Conveyor
(Bucket Conveyor)**



**FIGURE 2-34: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
Erratic Feeding From The Coal Feed Conveyor
(Bucket Conveyor)**

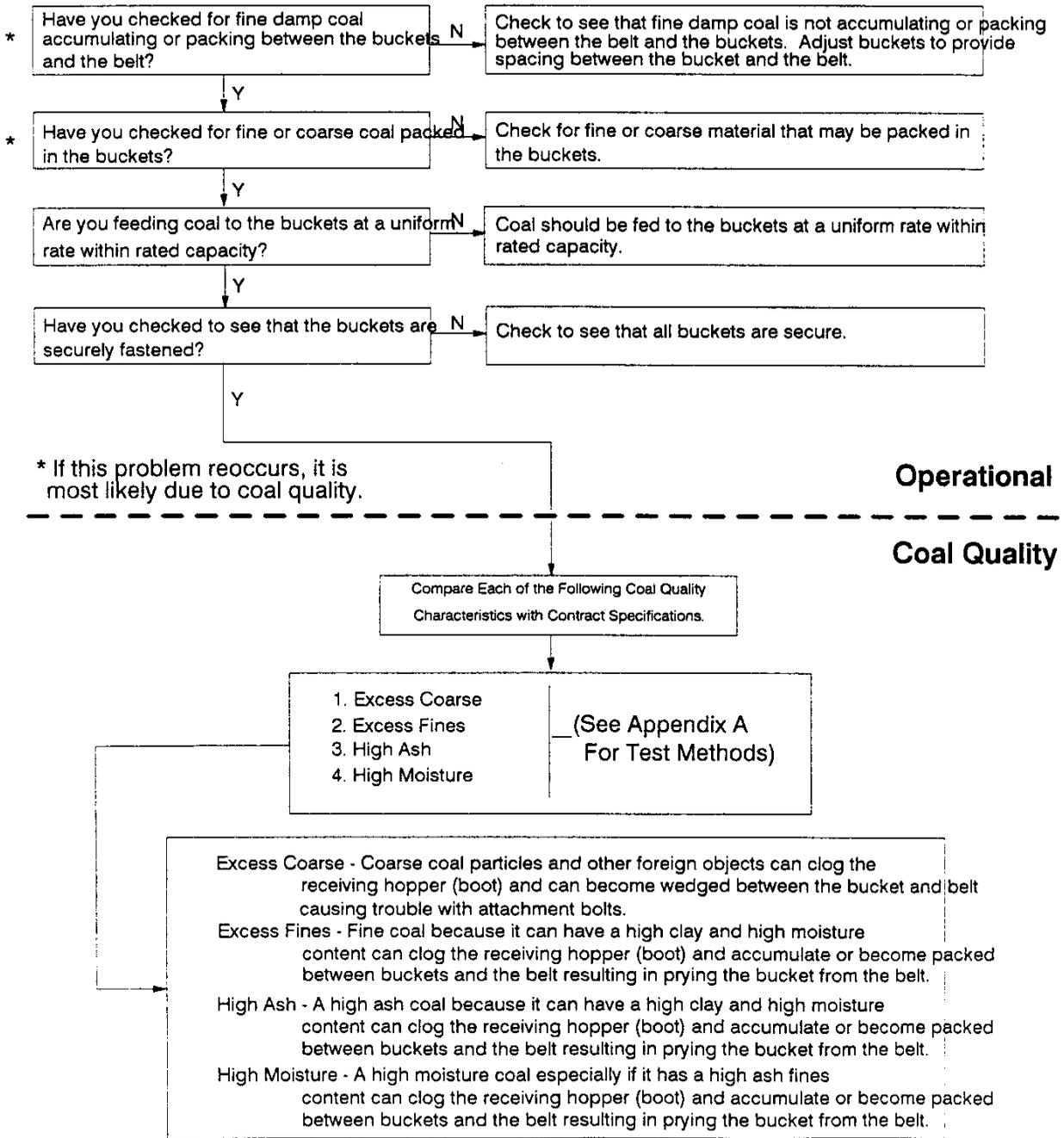
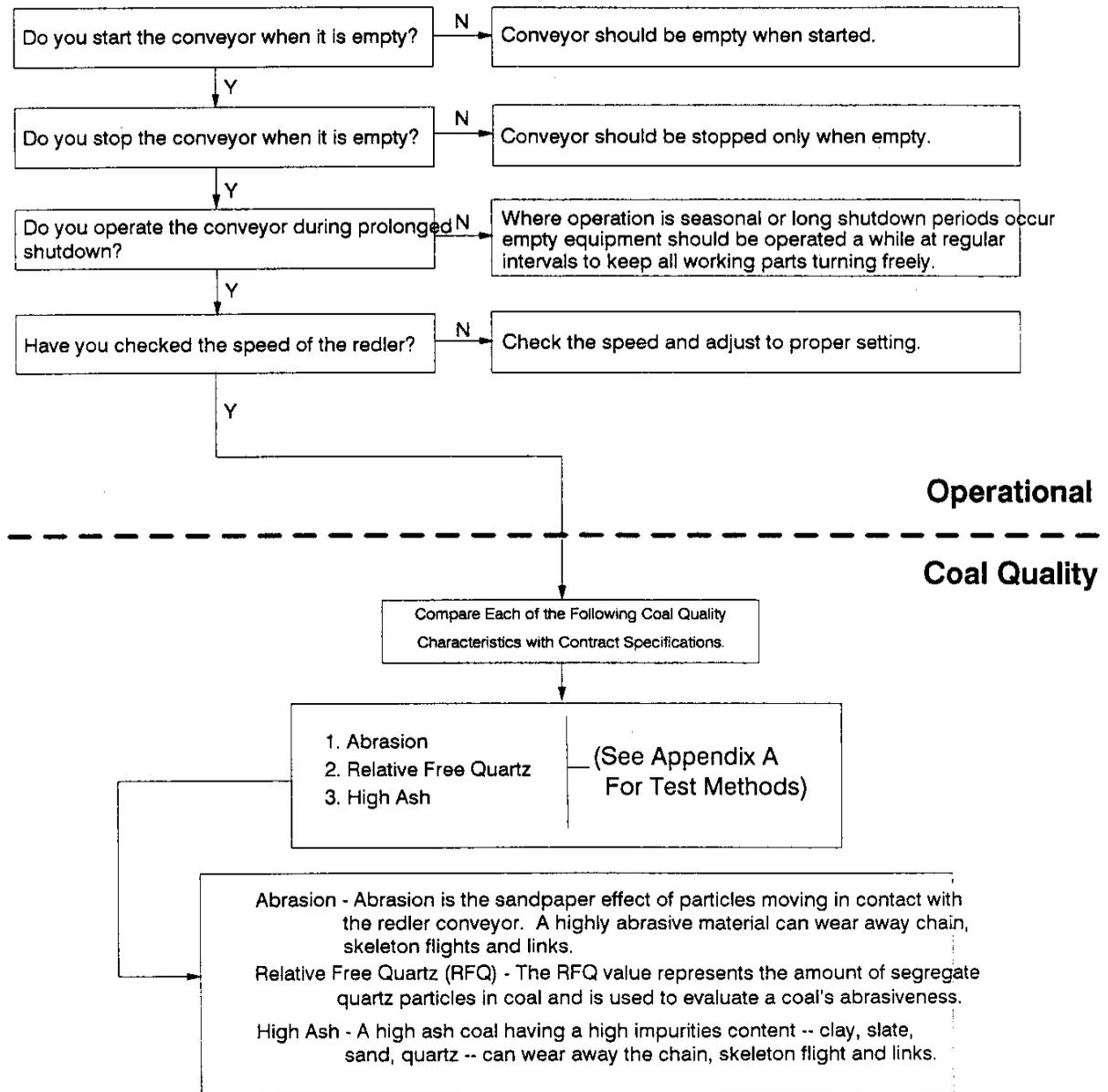


FIG2-34n/1

**FIGURE 2-35: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of Coal Feed Conveyors
(Redler Conveyors)**



**FIGURE 2-36: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feed Conveyor
(Redler Conveyor)**

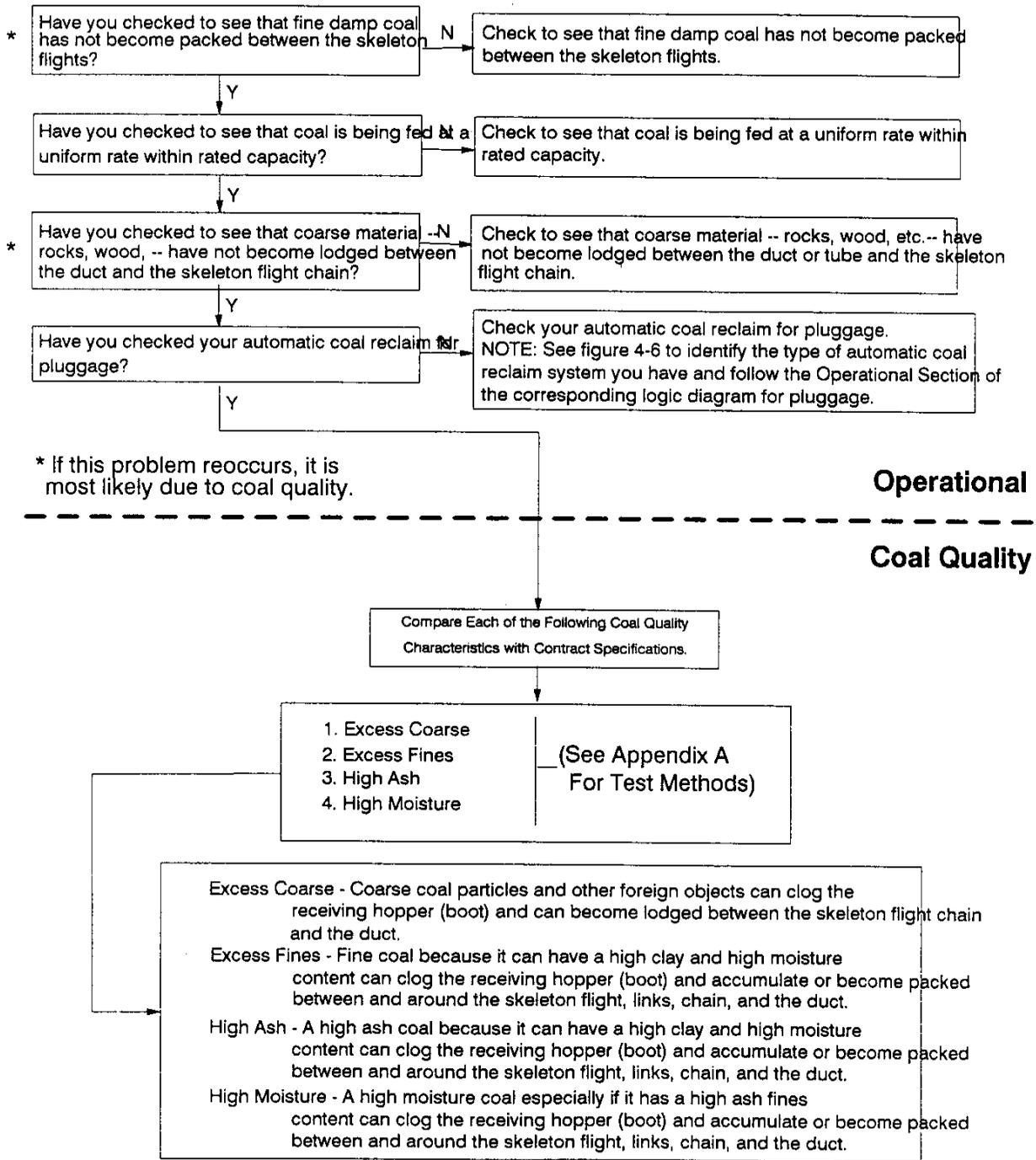


FIG2-36r/1

**FIGURE 2-37: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity In The Coal Feed Conveyor
(Redler Conveyor)**

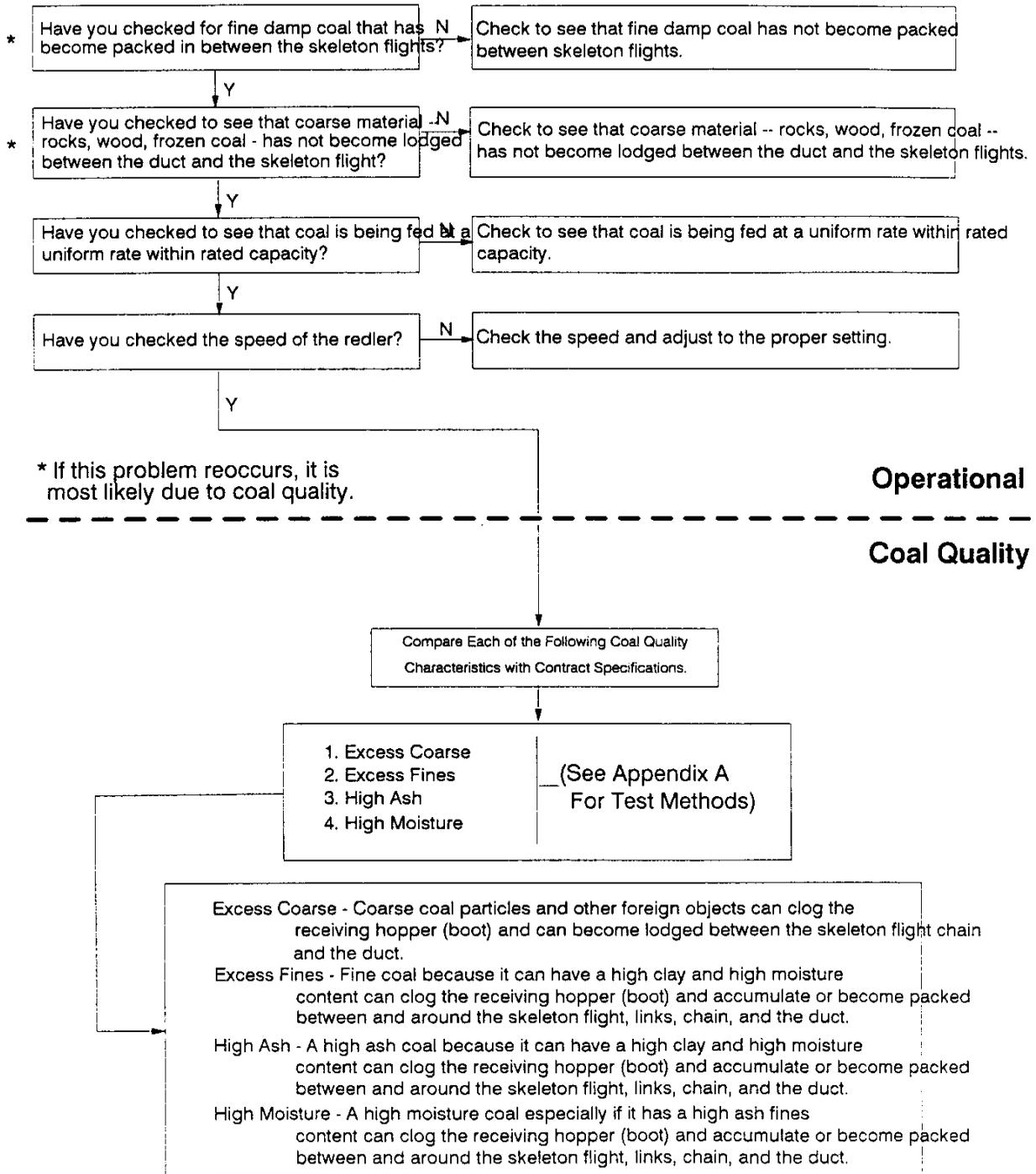
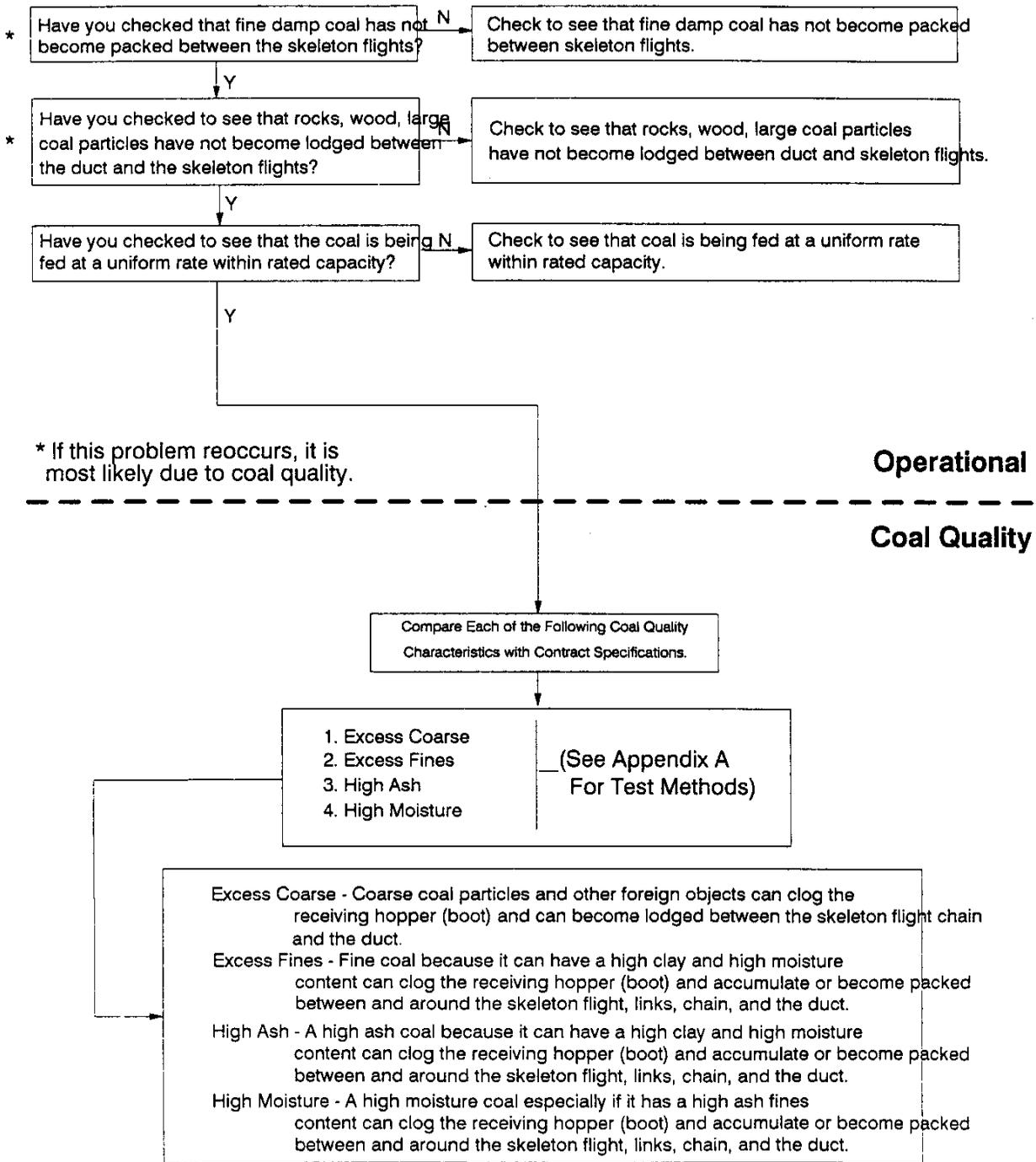
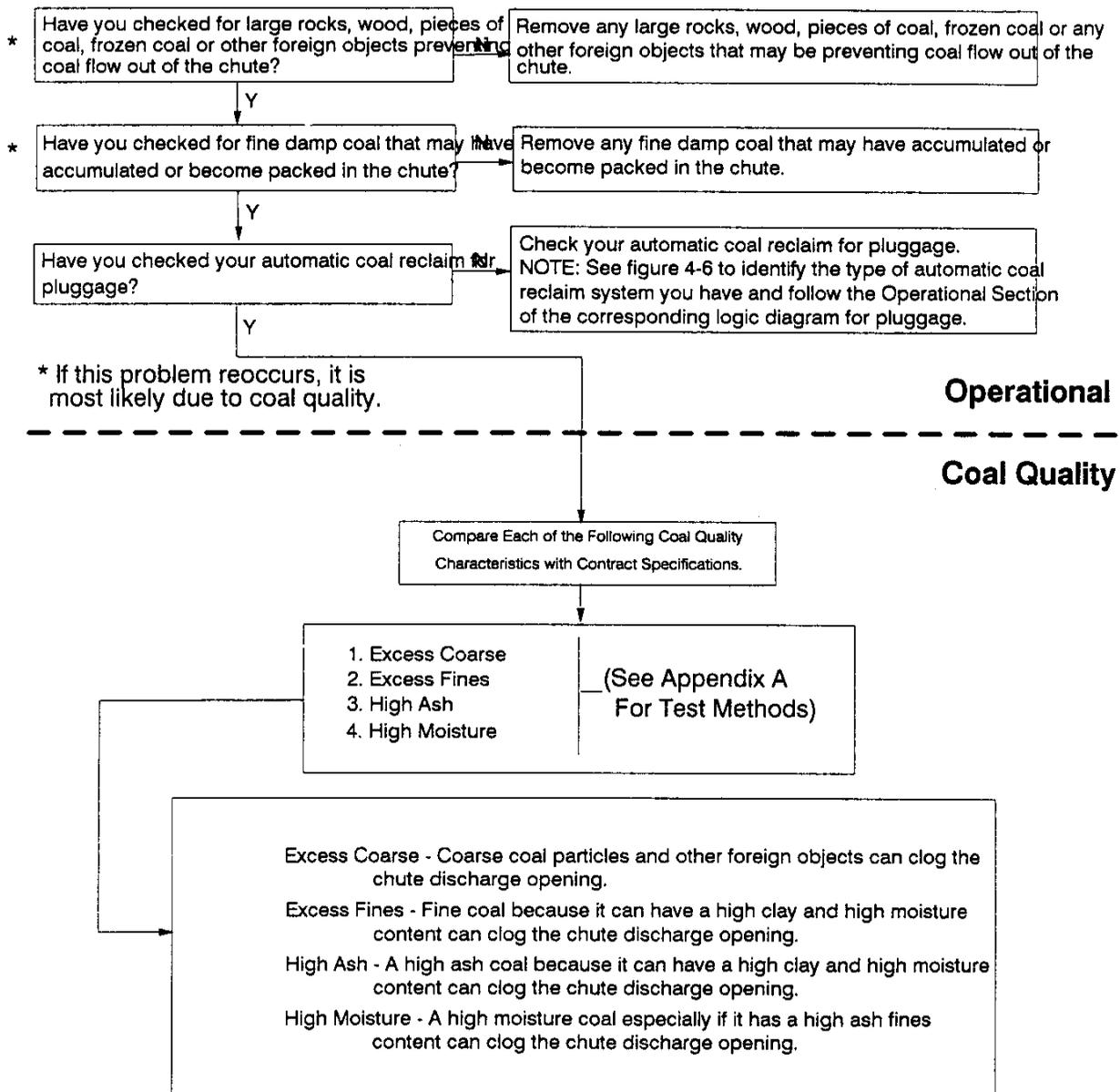


FIG2-37/N1

**FIGURE 2-38: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Feed Conveyor
(Redler Conveyor)**



**FIGURE 2-39: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feed Conveyor
(Chutes)**



**FIGURE 2-40: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity In The Coal Feed Conveyor
(Chutes)**

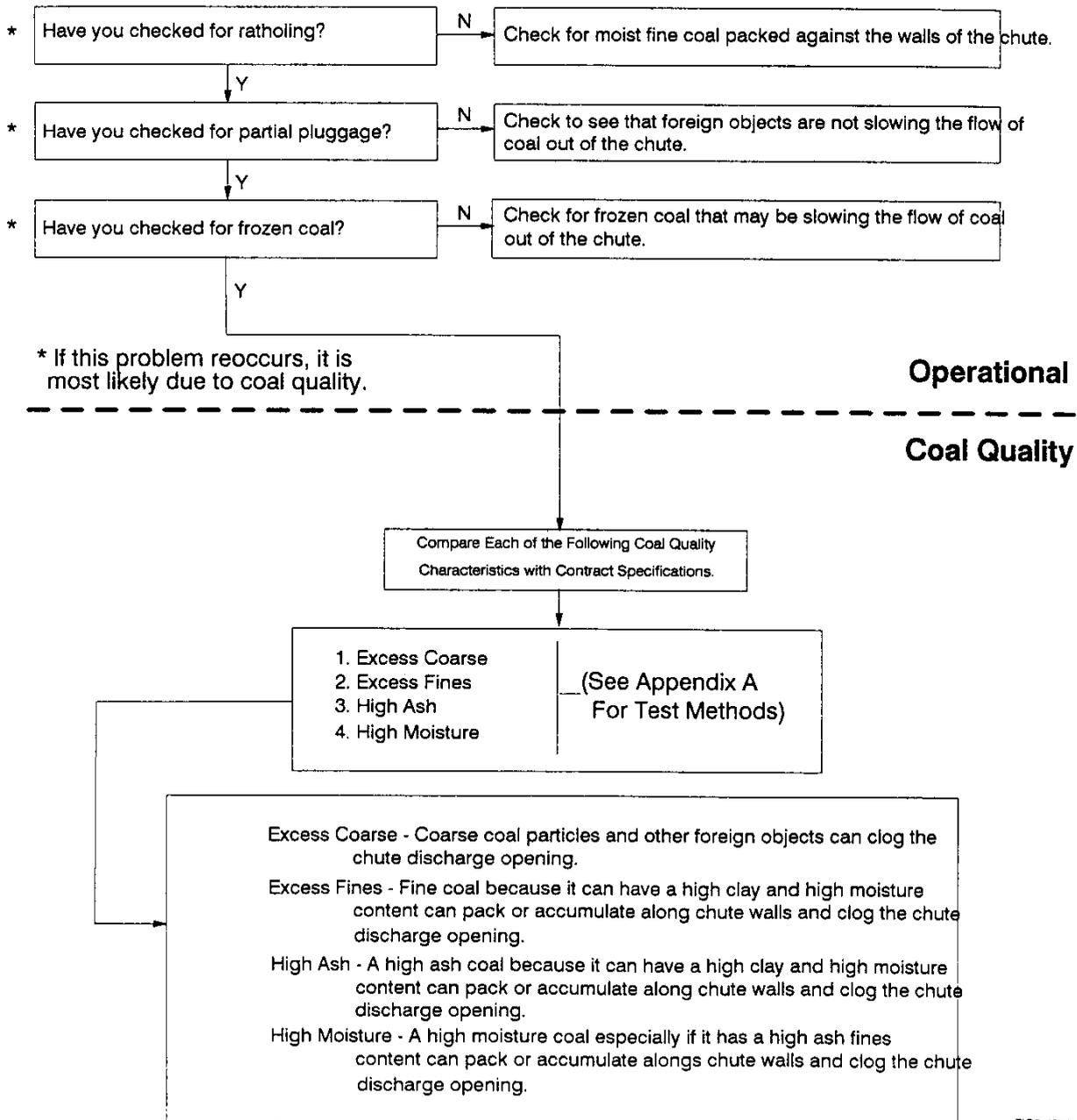


FIG2-40n/1

**FIGURE 2-41: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Feed Conveyor
(Chute)**

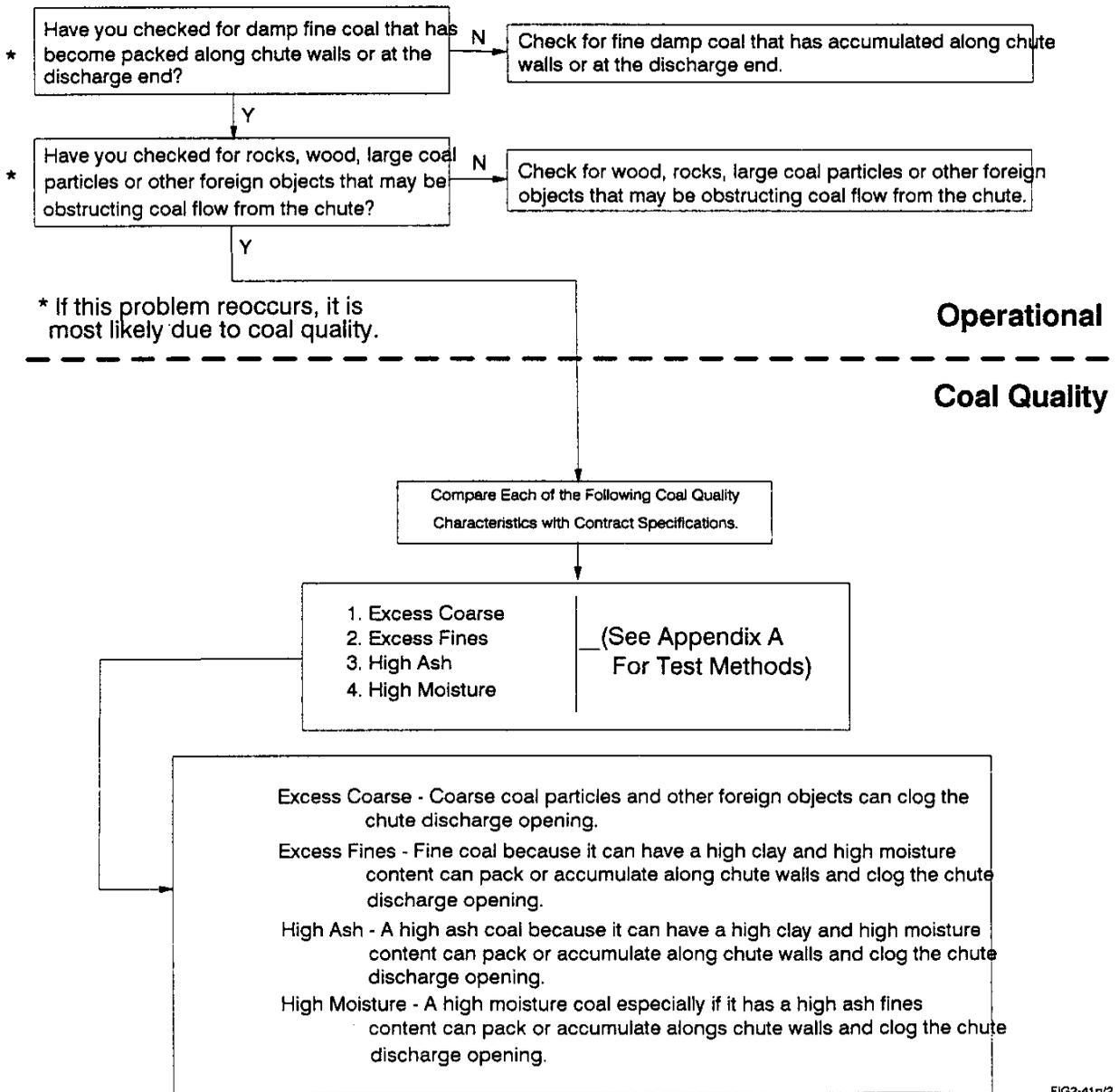
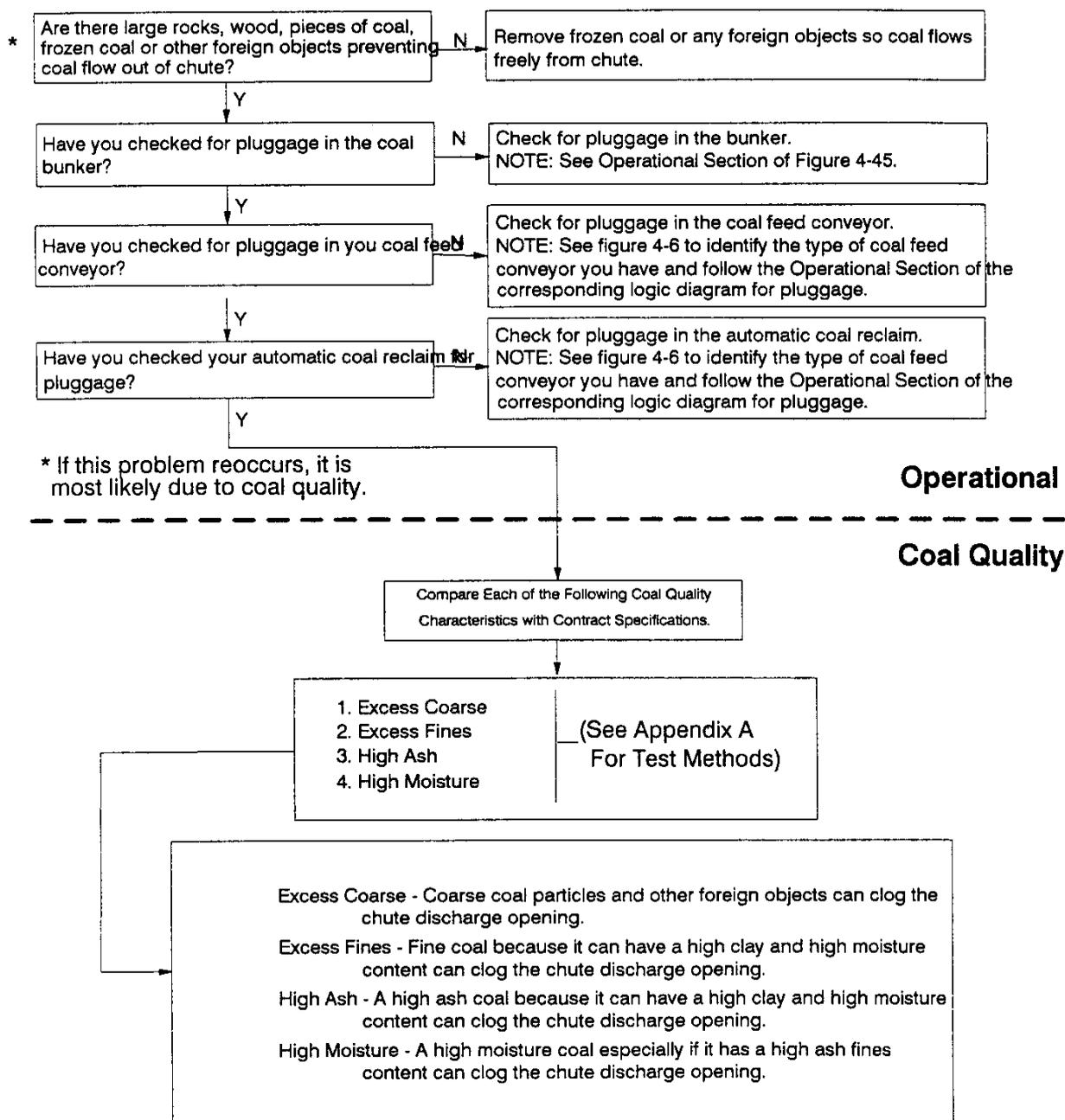
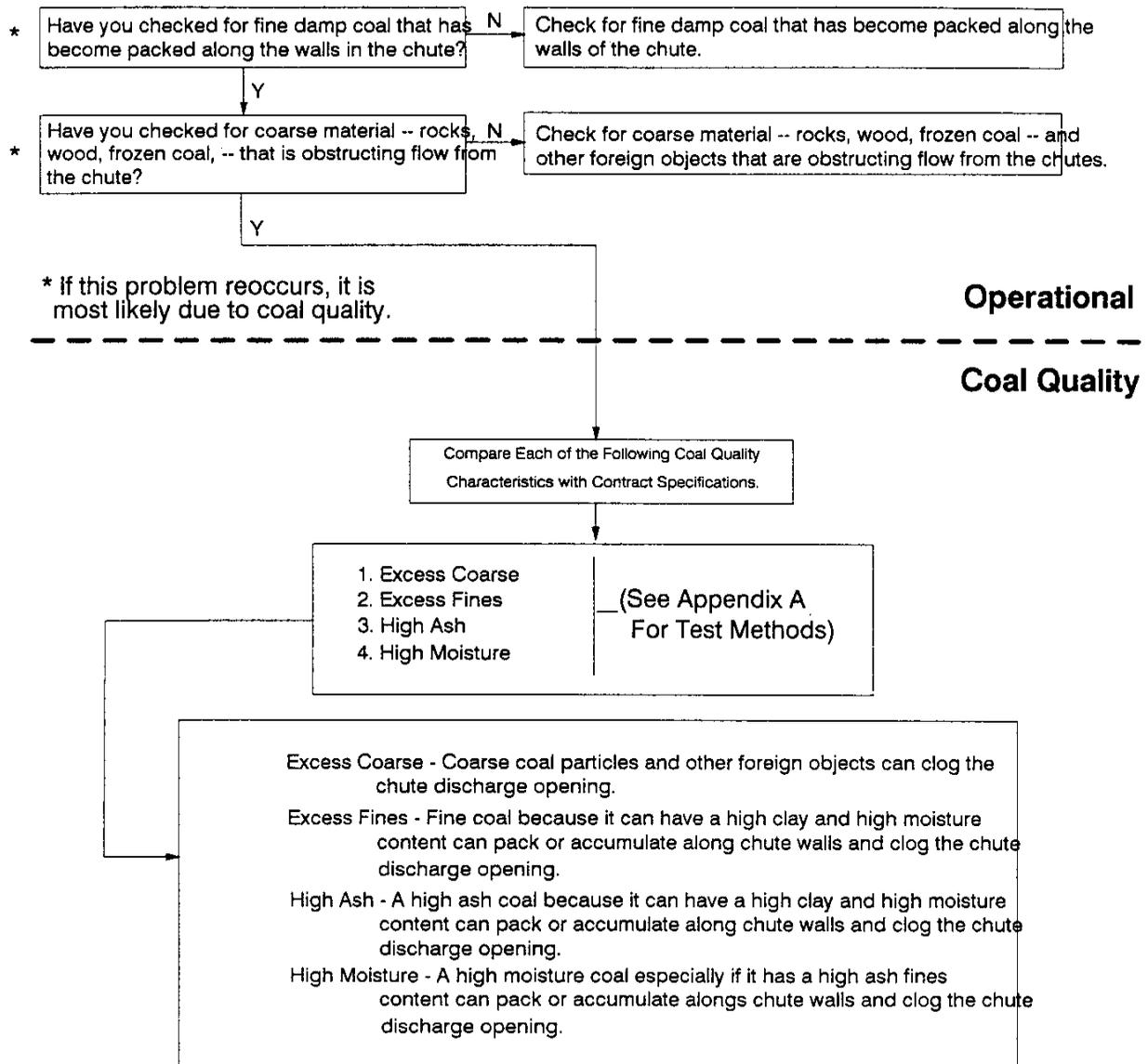


FIG2-41r/2

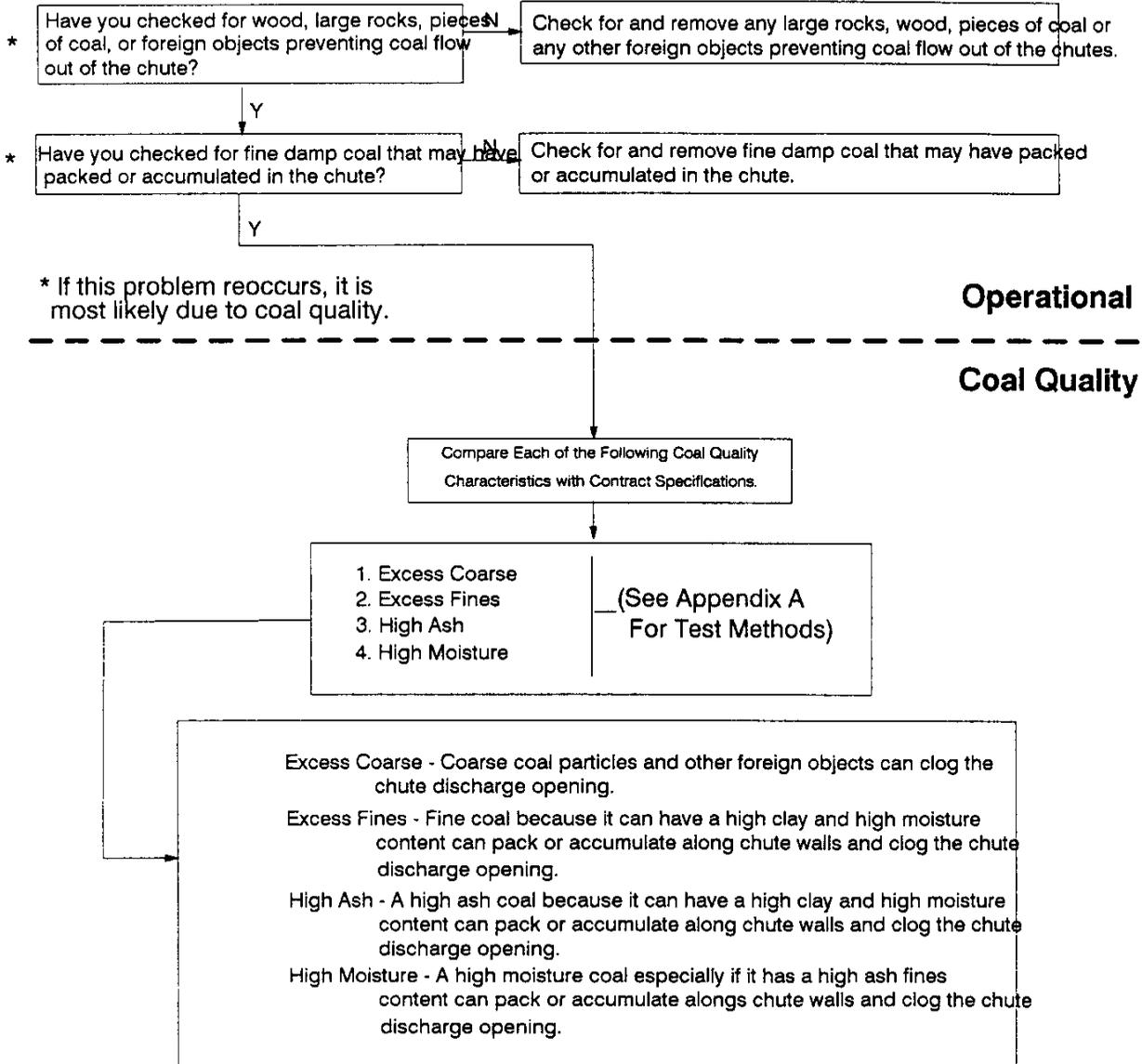
**FIGURE 2-42: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Feeders
(Chute)**



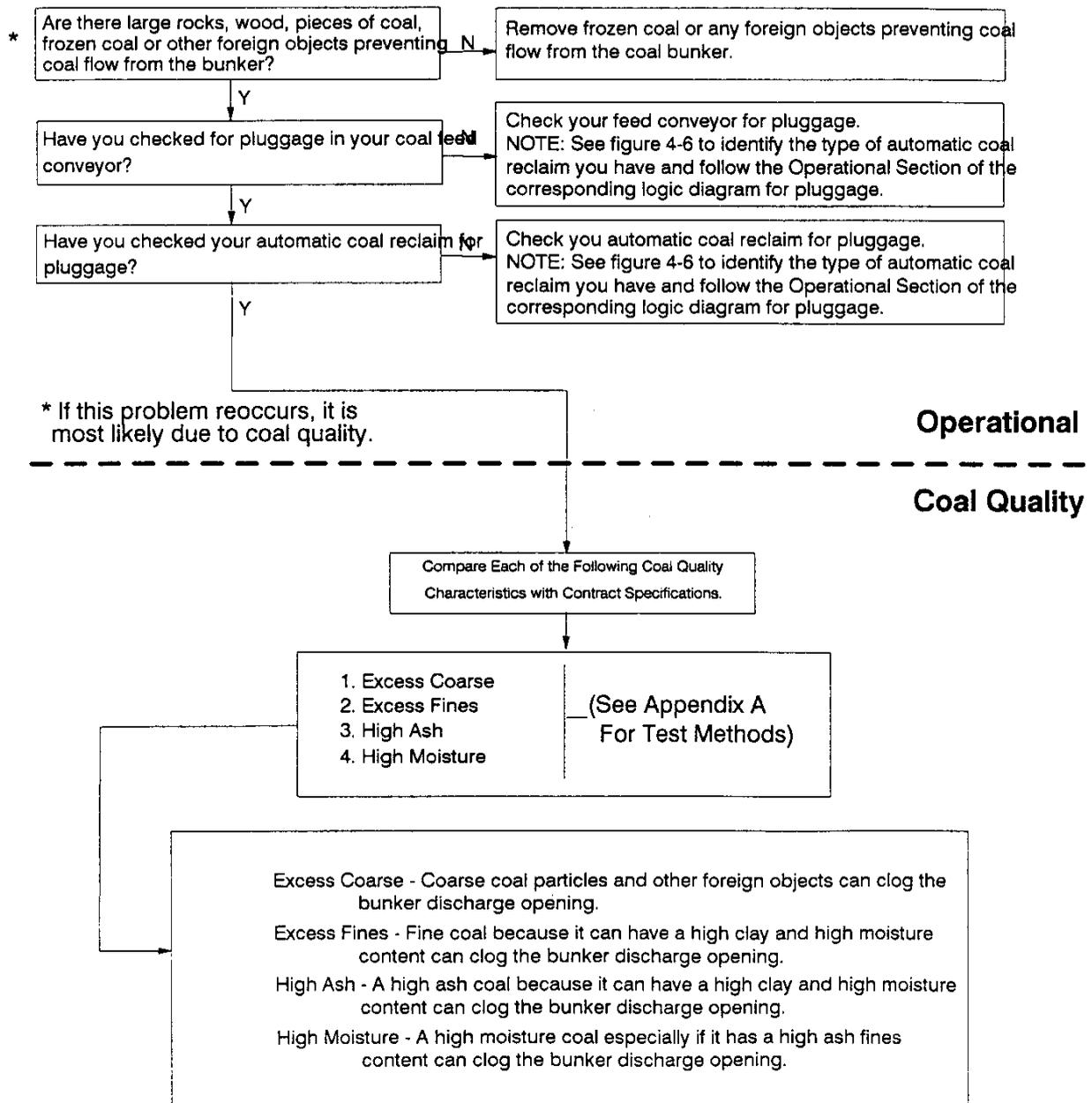
**FIGURE 2-43: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity In the Coal Feeder
(Chutes)**



**FIGURE 2-44: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Feeder
(Chutes)**



**FIGURE 2-45: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Bunker**



**FIGURE 2-46: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity In The Bunker**

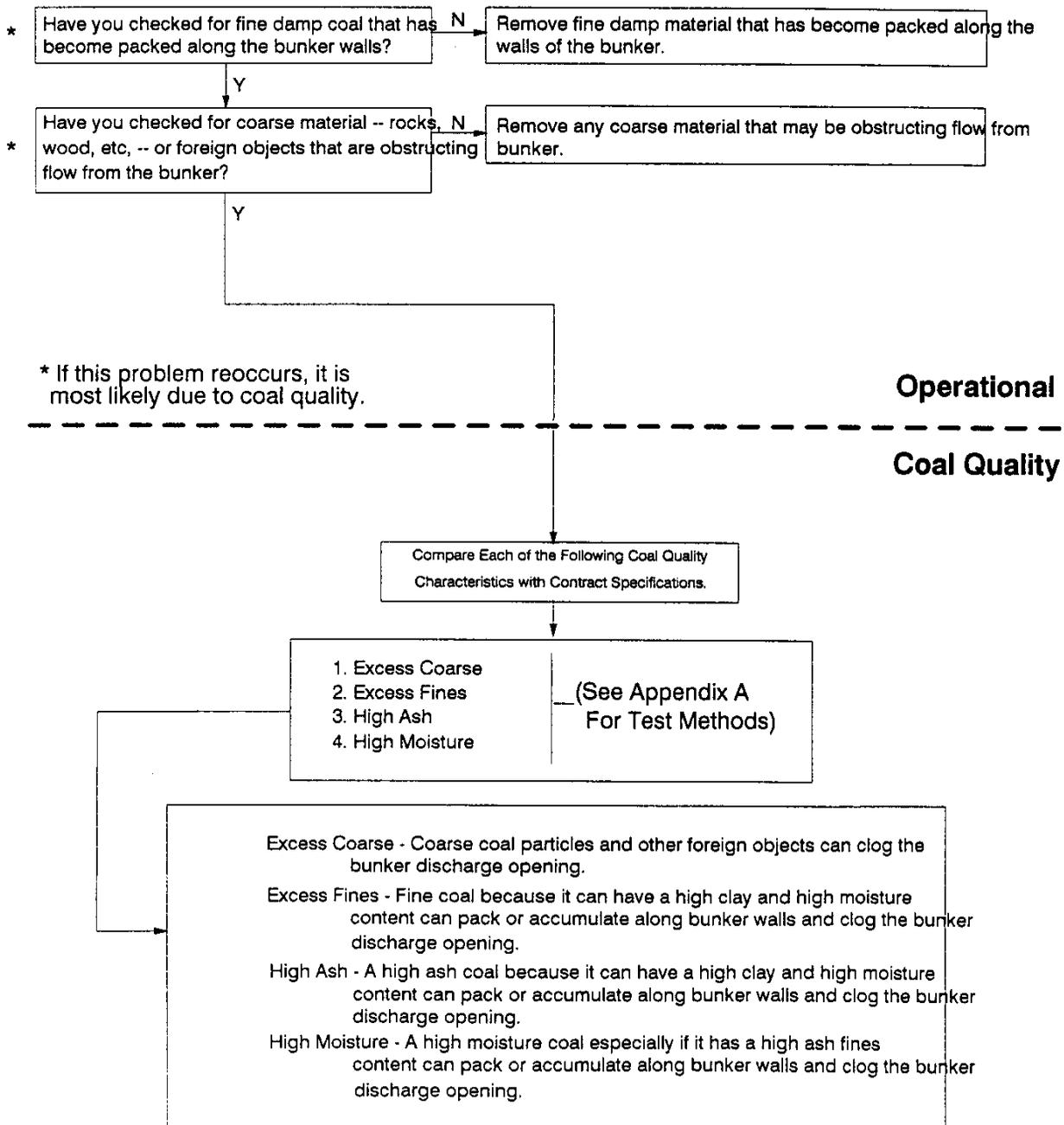


FIG2-46v2

**FIGURE 2-47: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Bunker**

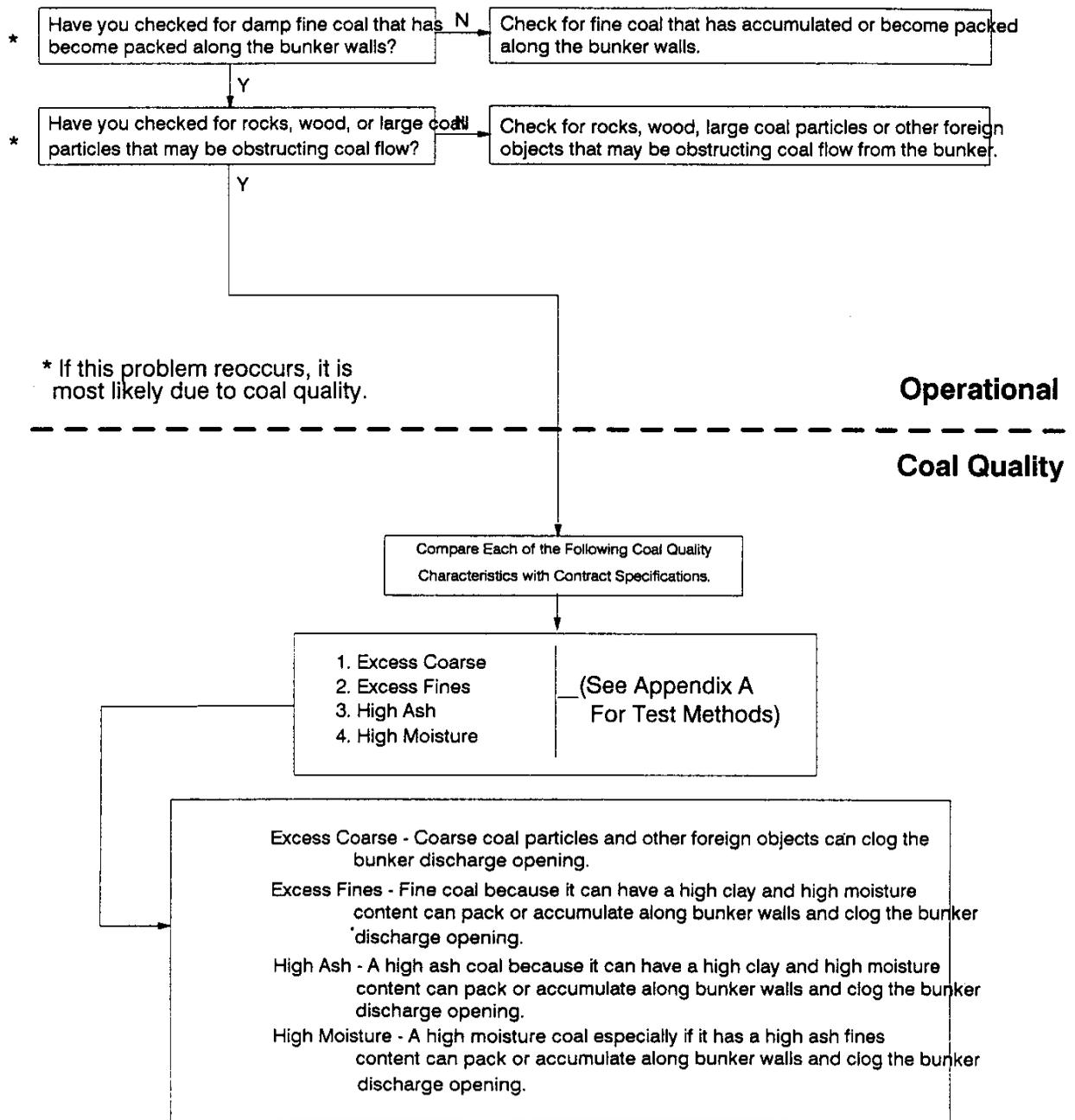


FIG2-47N/2

**FIGURE 2-48: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage In The Coal Hopper**

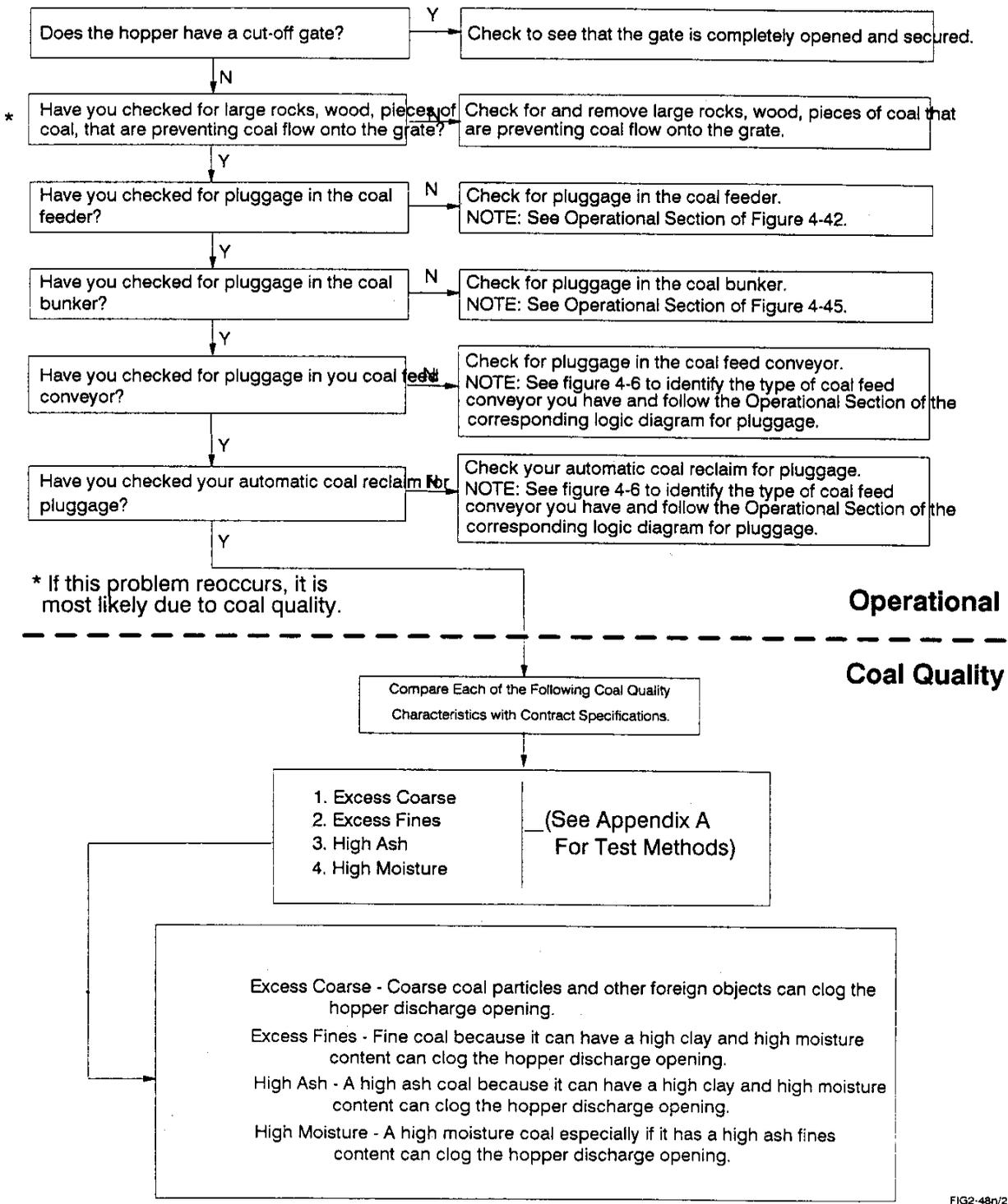
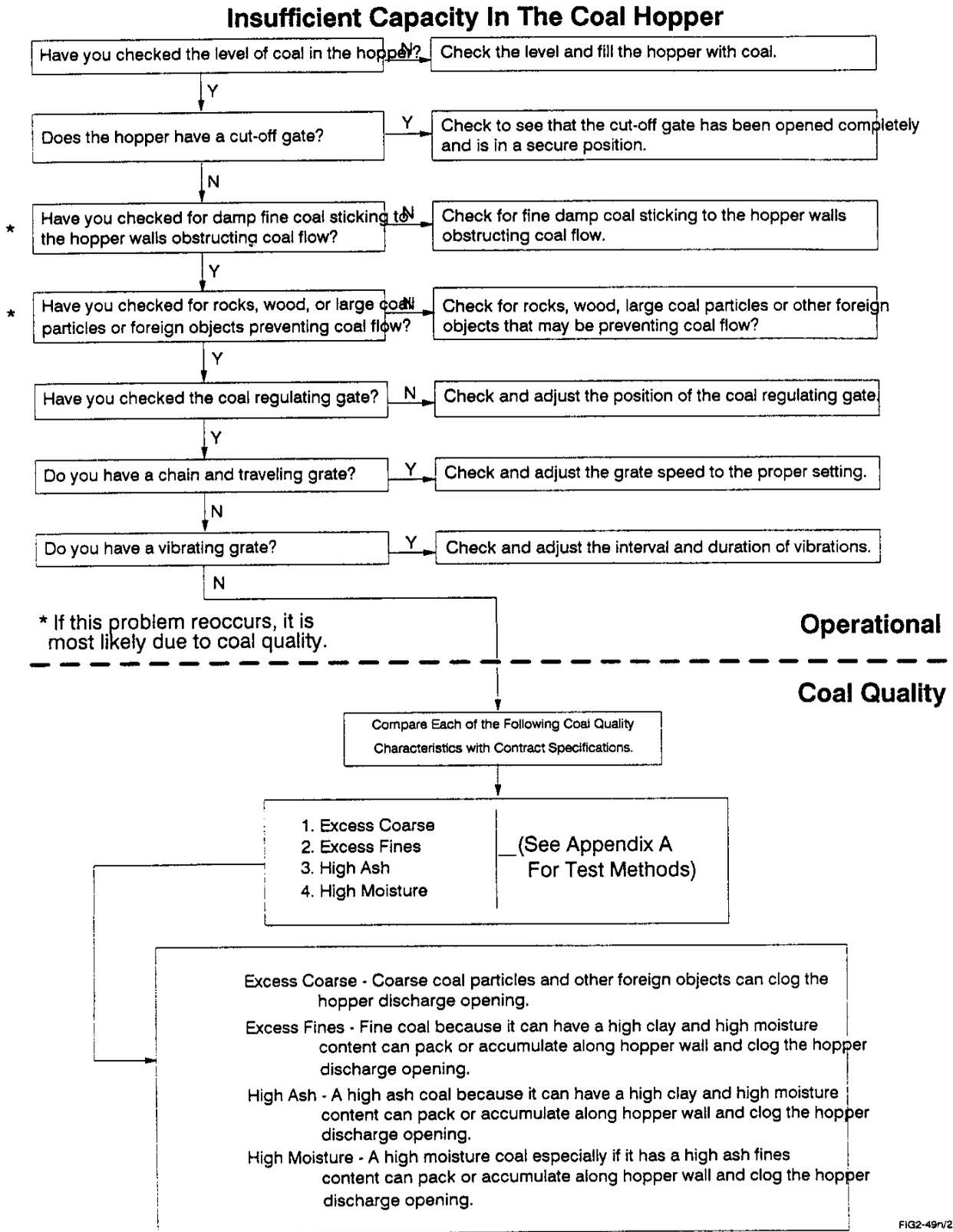
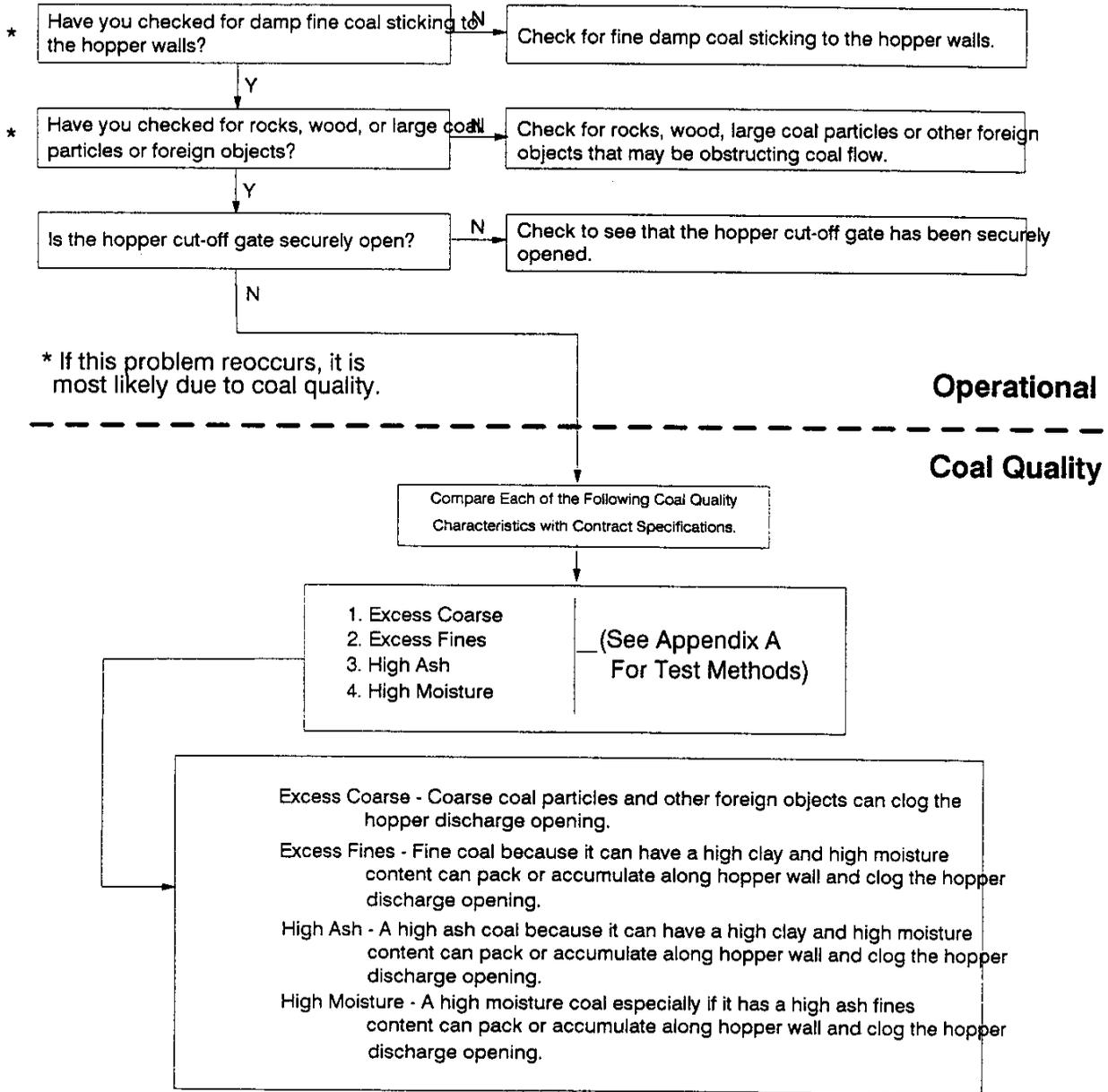


FIG2-48v2

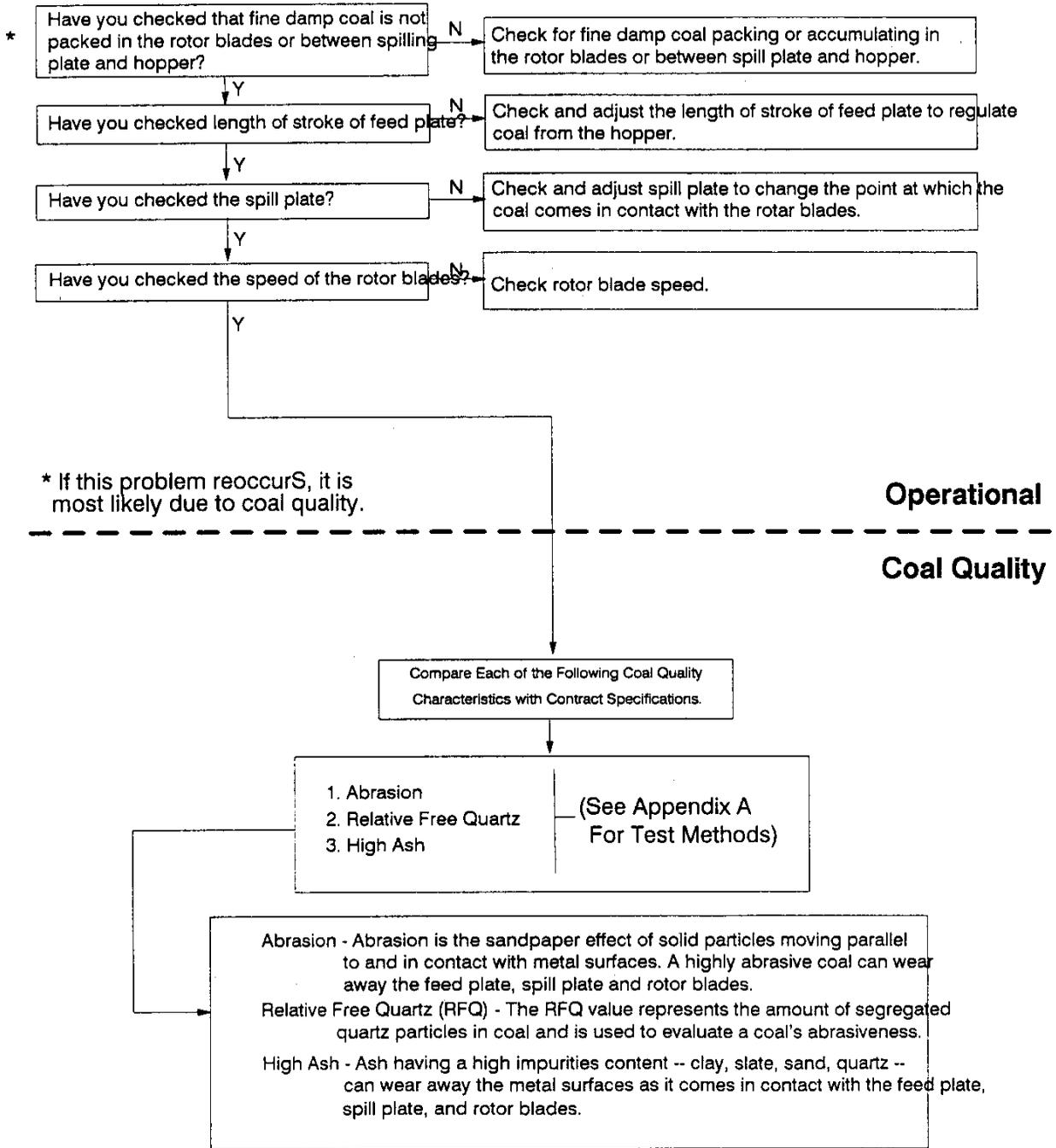
FIGURE 2-49: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM



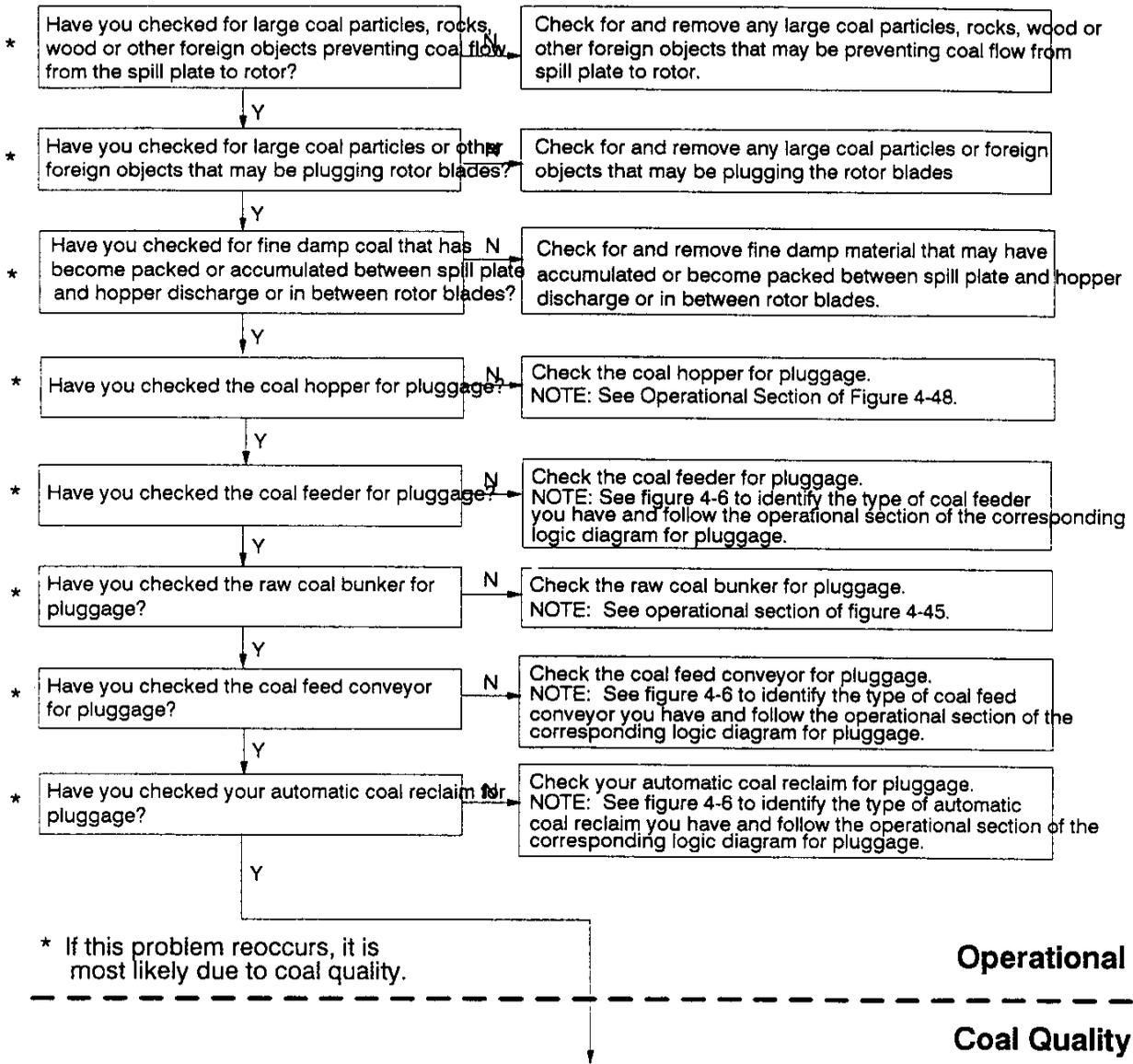
**FIGURE 2-50: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Coal Hopper**



**FIGURE 2-51: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Wear Of The Feeder-Distributor Mechanism**

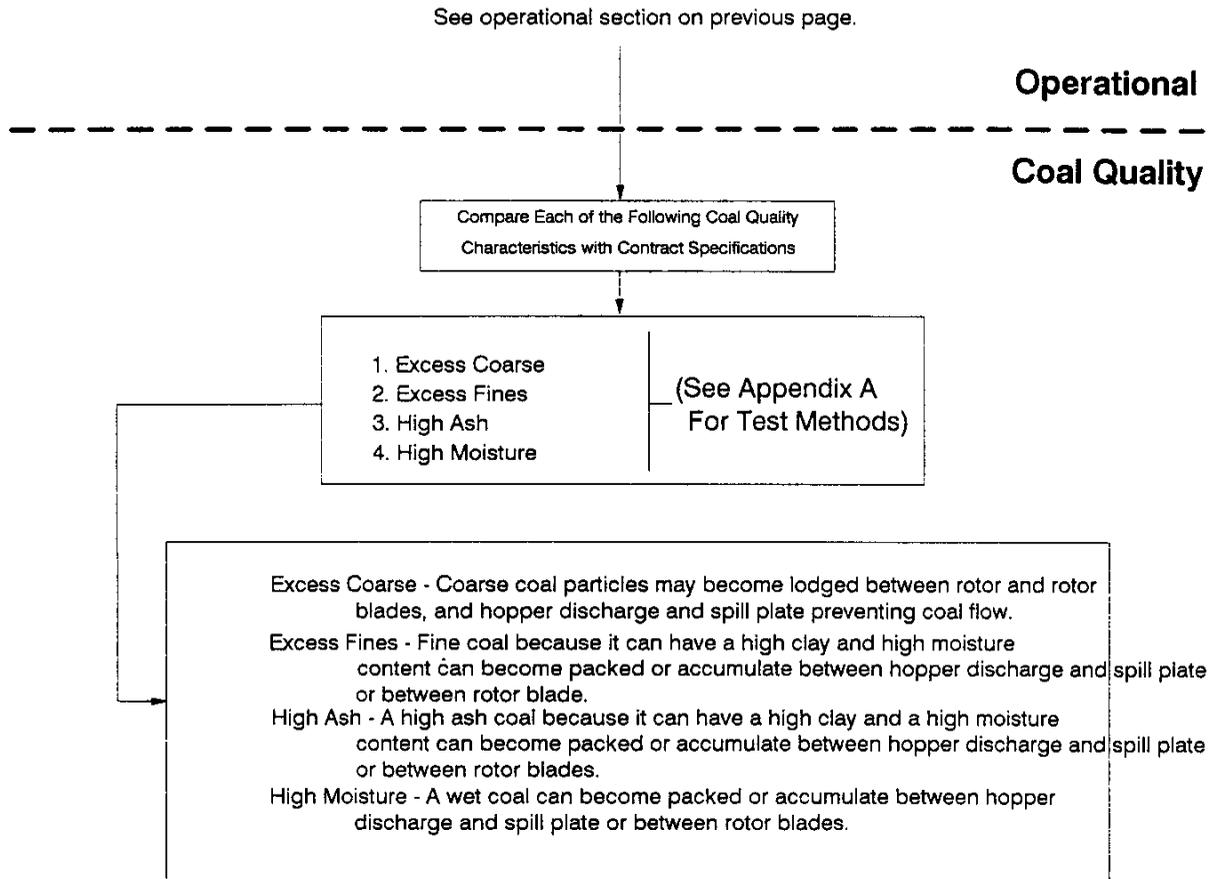


**FIGURE 2-52: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage From The Feeder Distributor Mechanism**



See next page for Coal Quality Section

**FIGURE 2-52 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pluggage From The Feeder Distributor Mechanism**



**FIGURE 2-53: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity From The Feeder Distributor Mechanism**

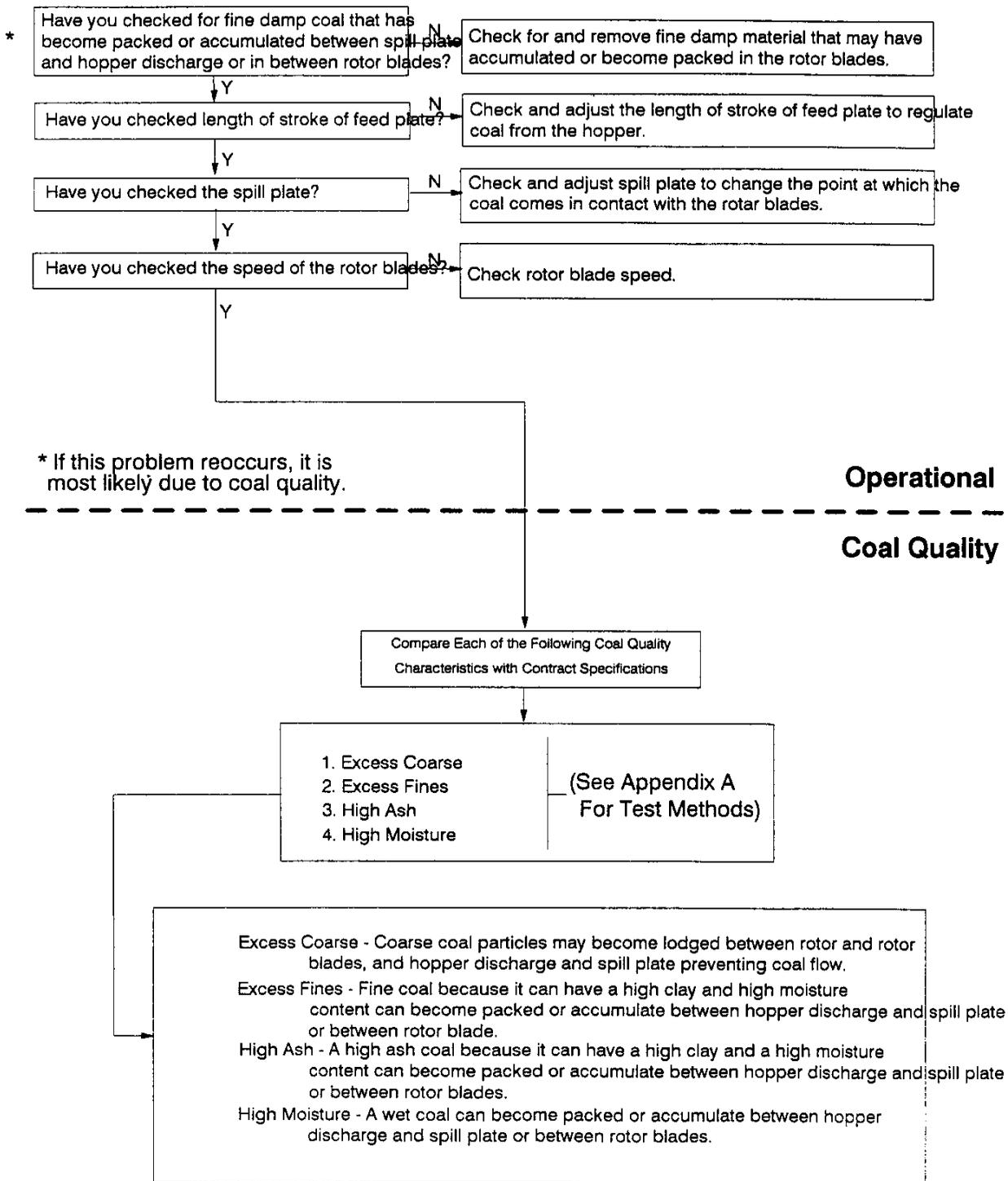


FIG2-53v2

**FIGURE 2-54: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erratic Feeding From The Feeder Distributor Mechanism**

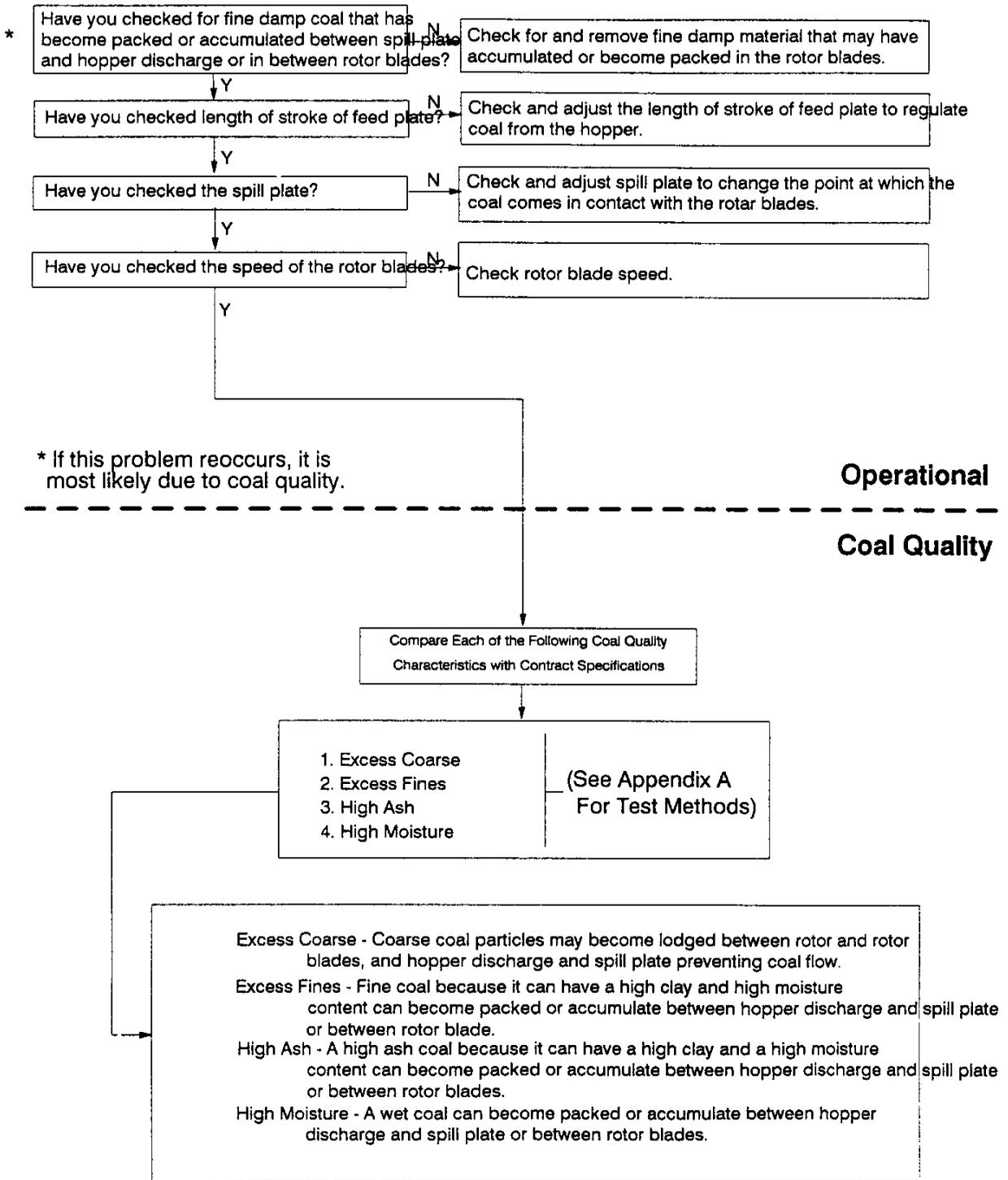


FIG2-54/2

**FIGURE 2-55: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity And Inability To Meet Load
(Boiler)**

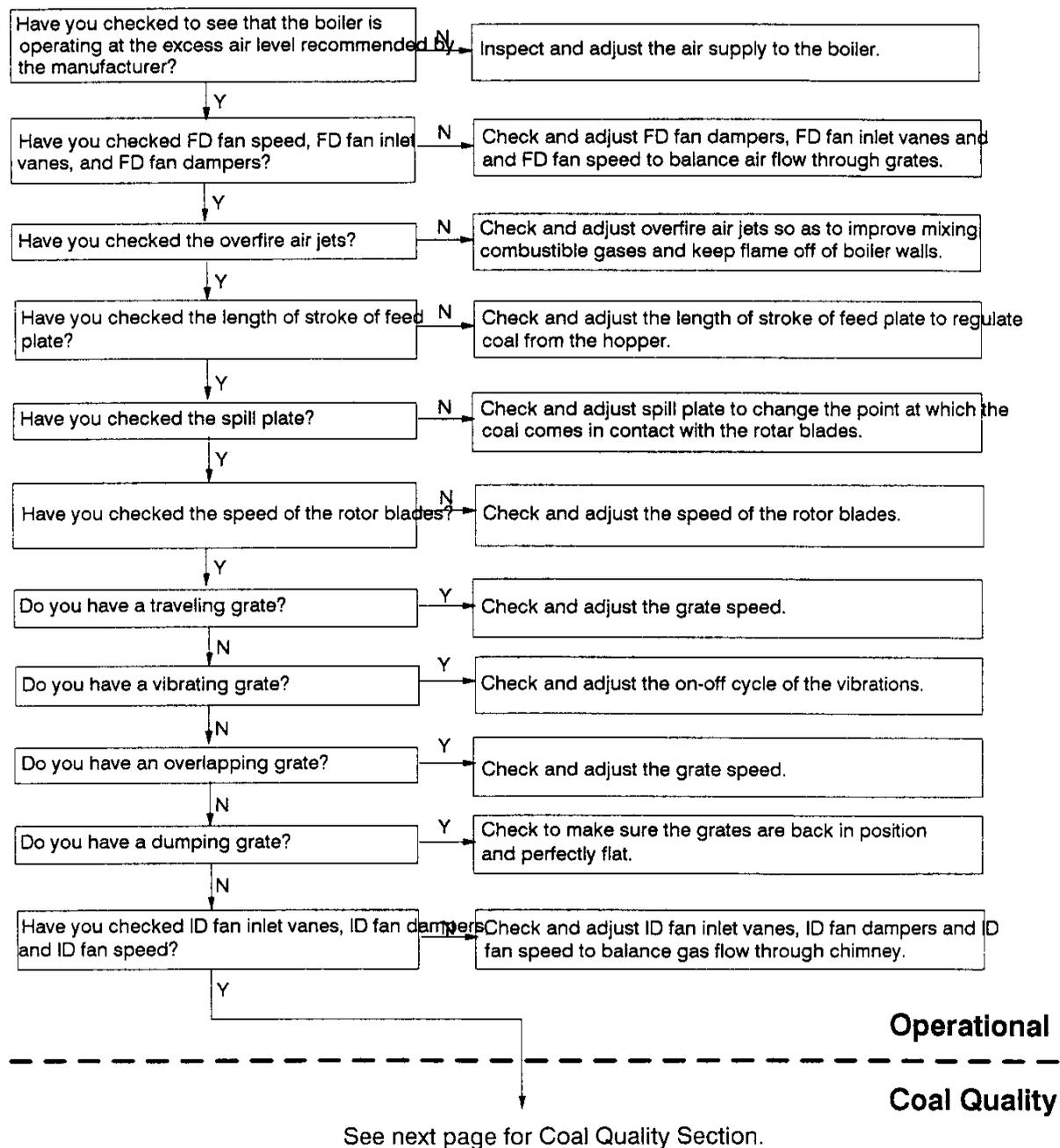
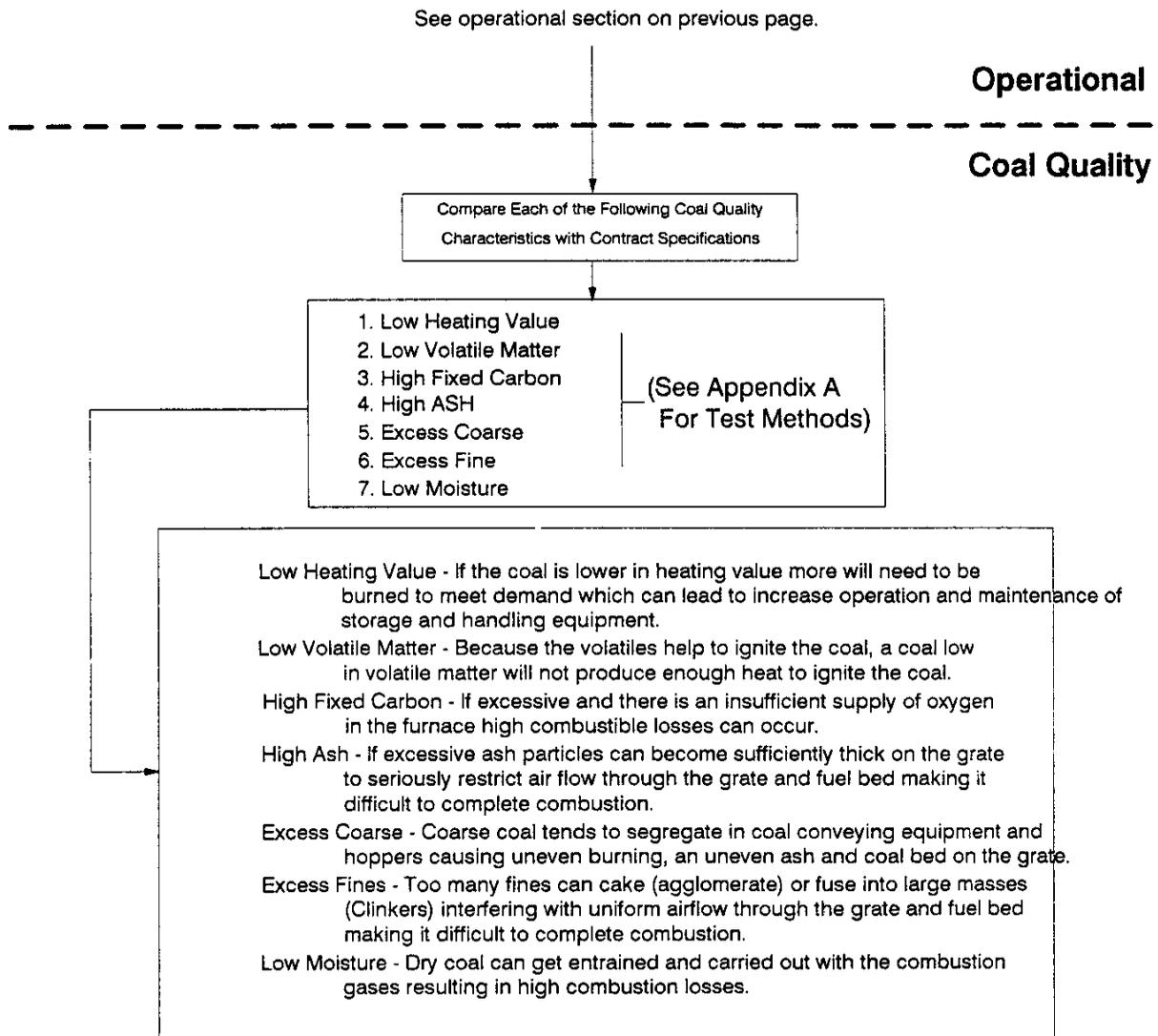


FIGURE 2-55 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM For Insufficient Capacity And Inability To Meet Load



**FIGURE 2-56: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Reduced Boiler Efficiency**

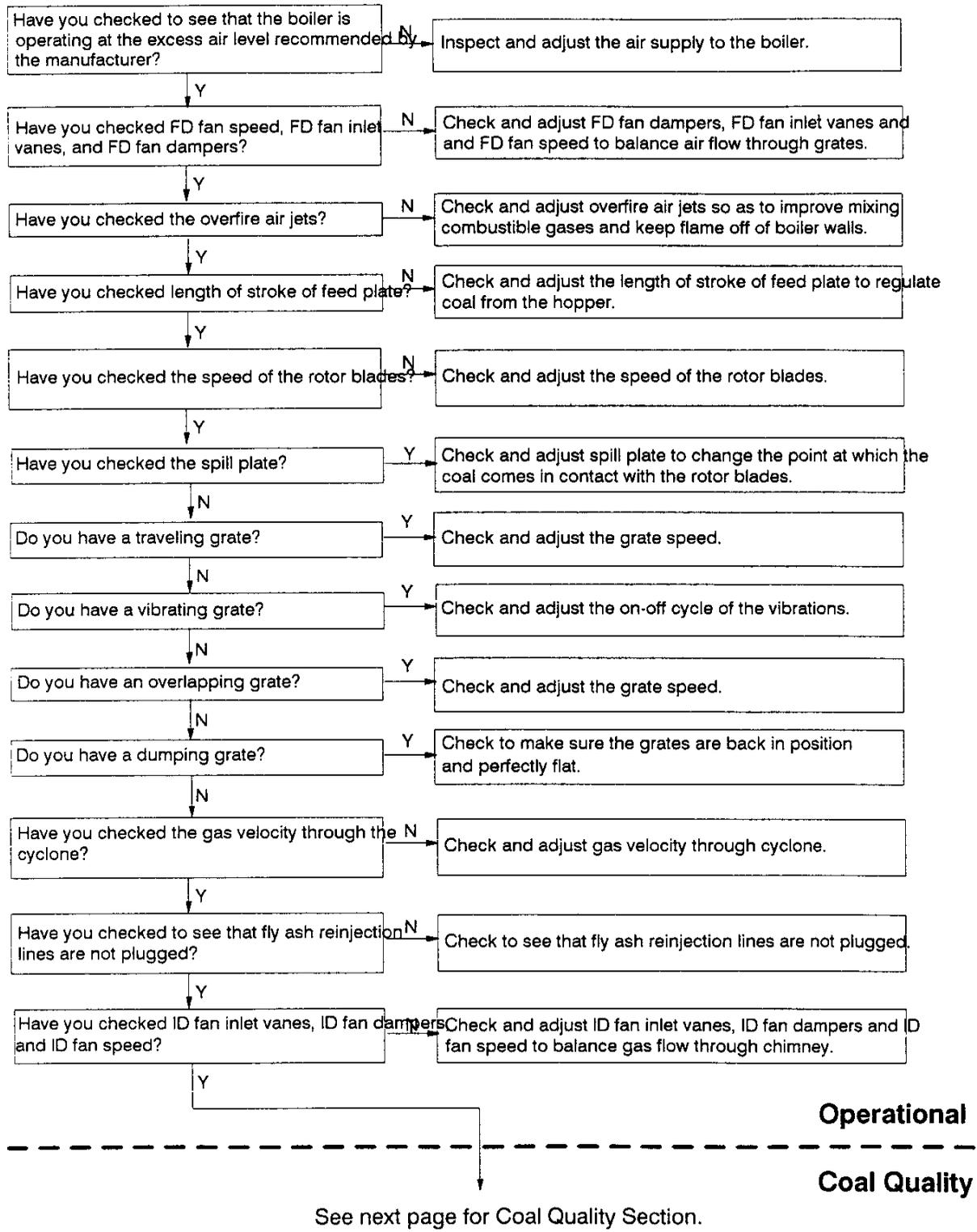
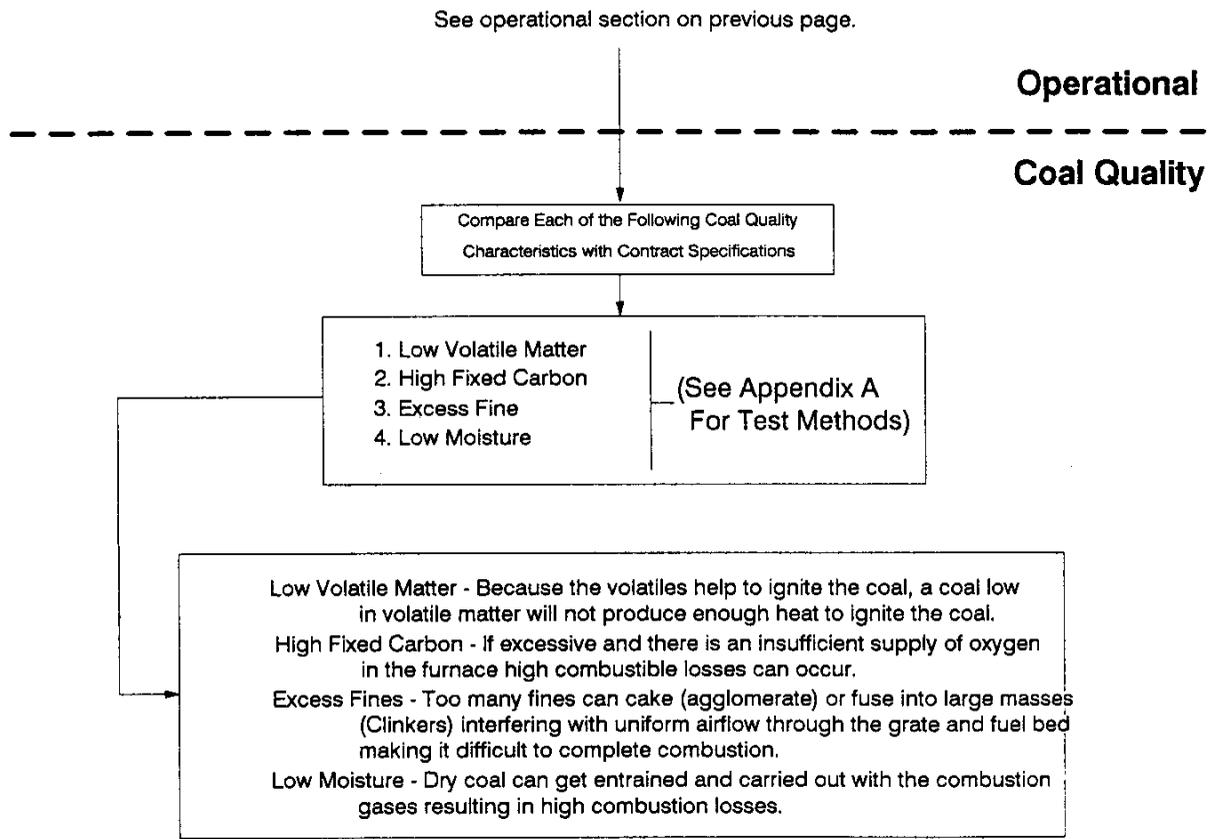
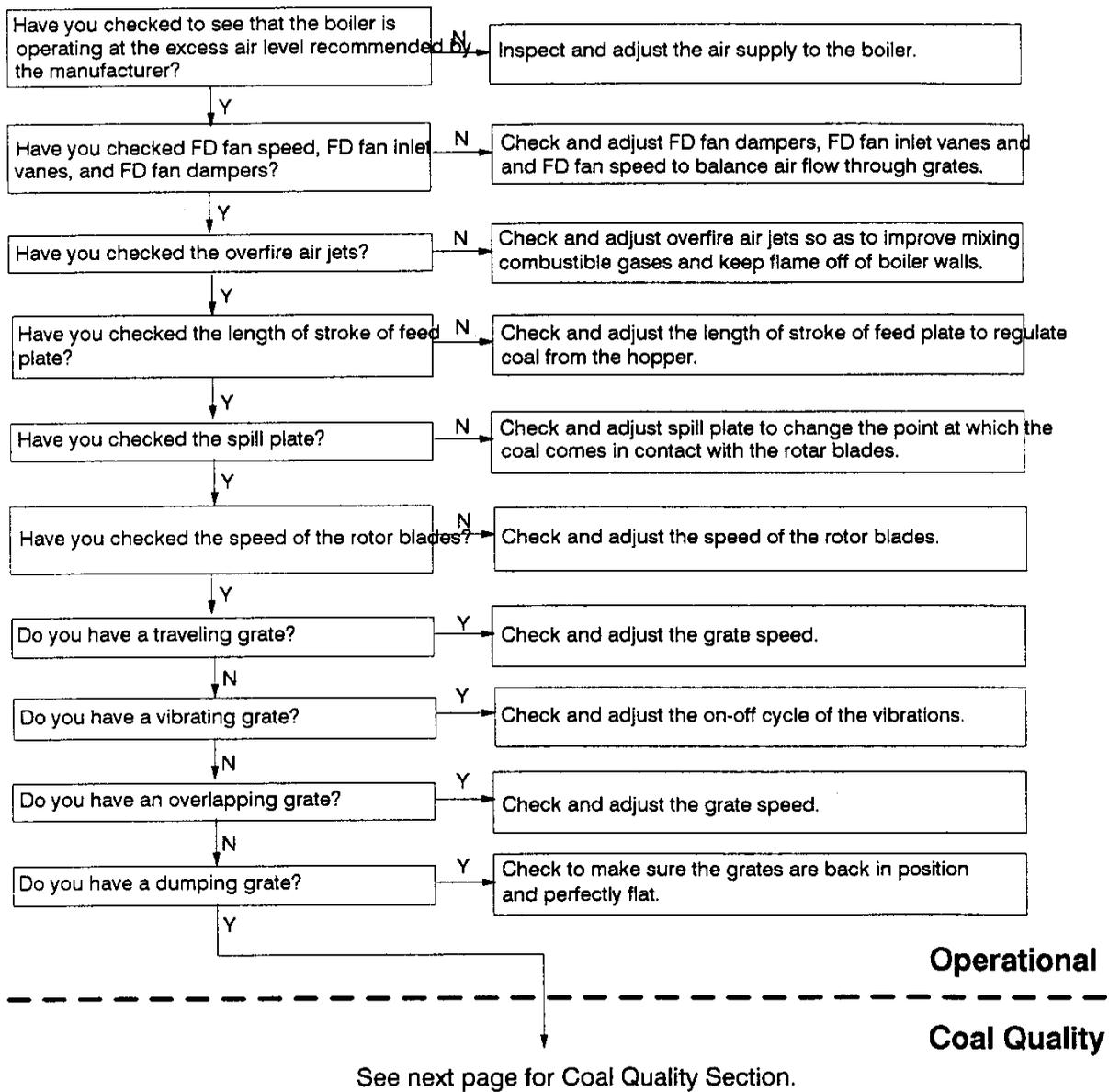


FIG2-56r/2

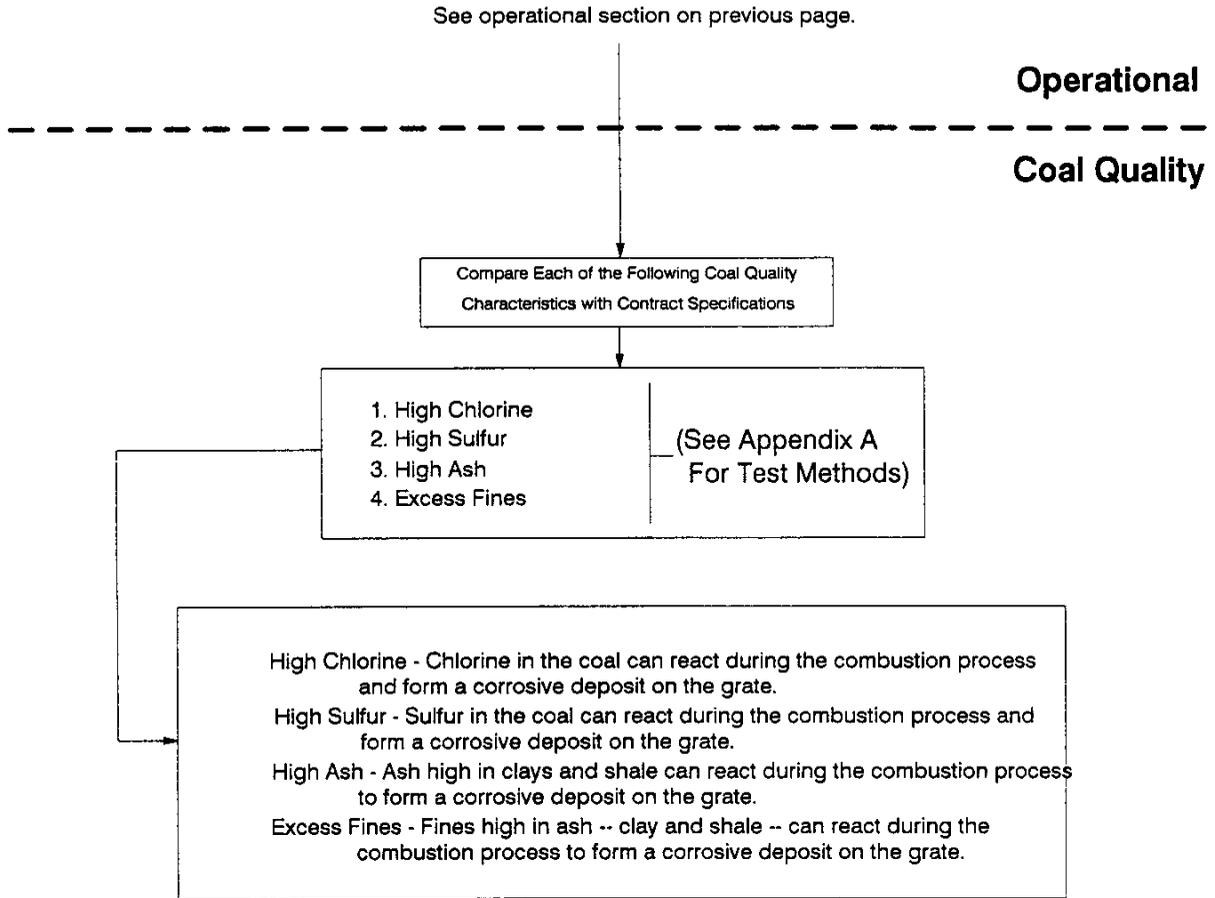
**FIGURE 2-56 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Reduced Boiler Efficiency**



**FIGURE 2-57: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Boiler Components
(Grates)**



**FIGURE 2-57 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Boiler Components
(Grates)**



**FIGURE 2-58: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Segregation On The Grate**

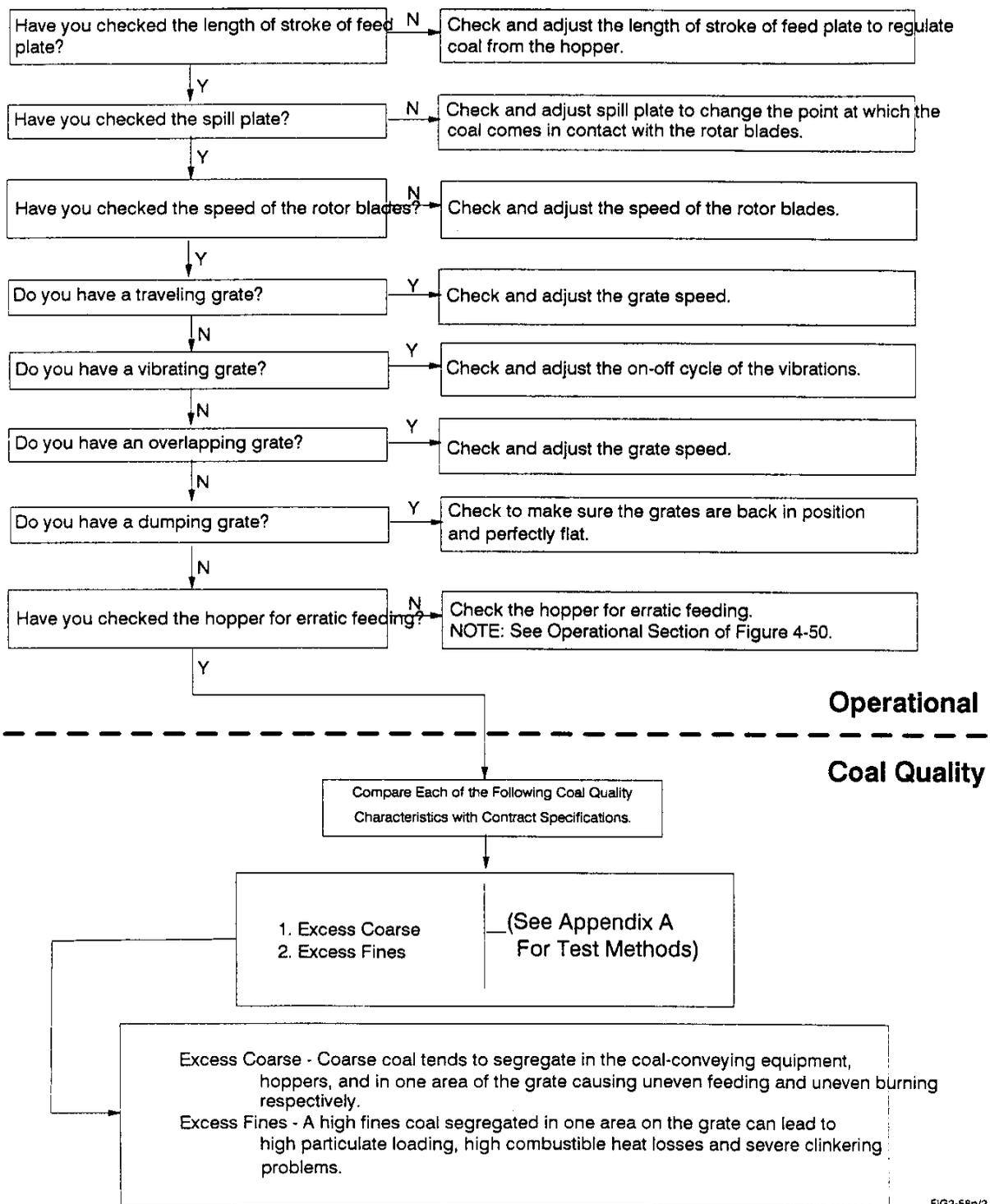
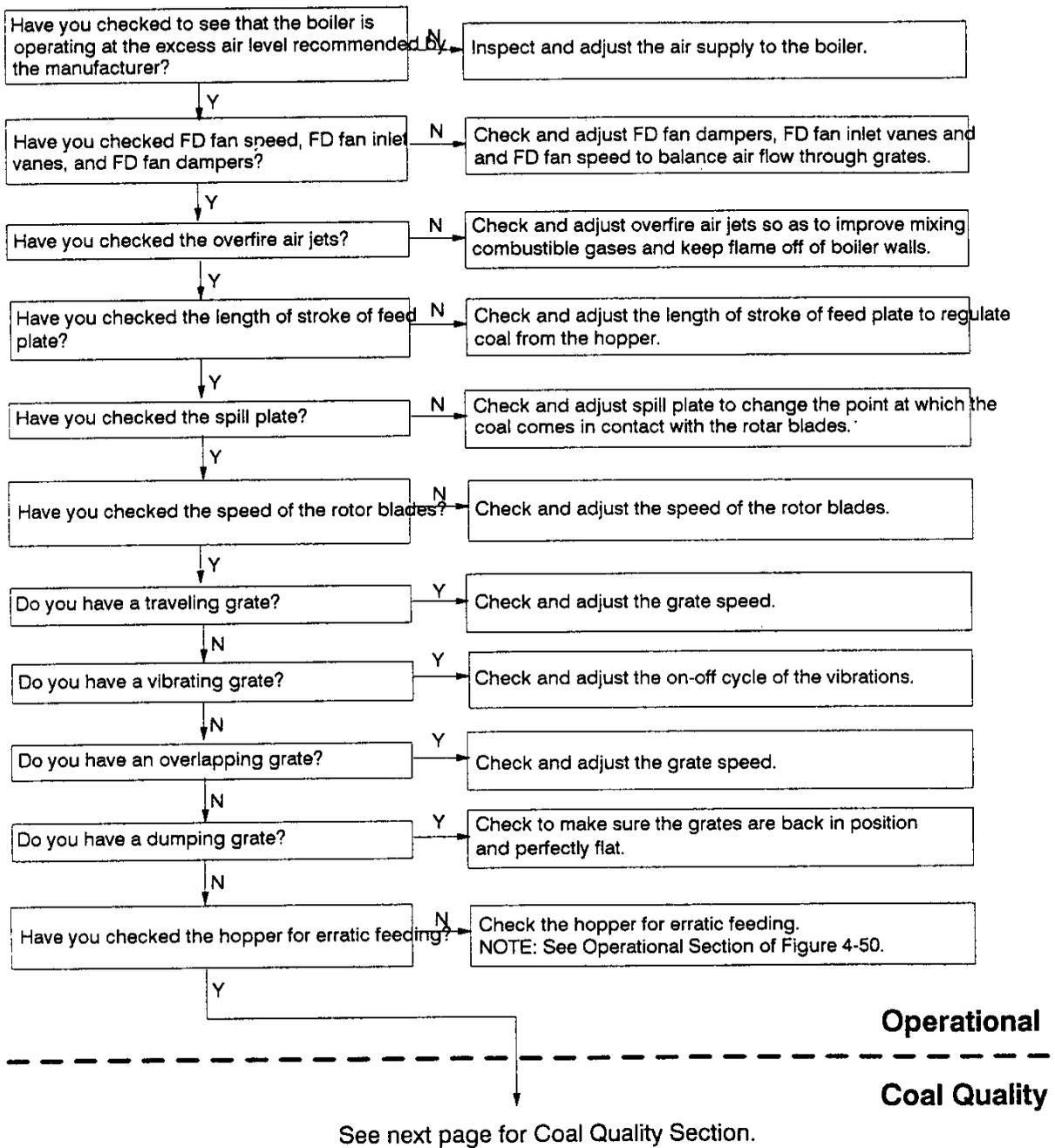
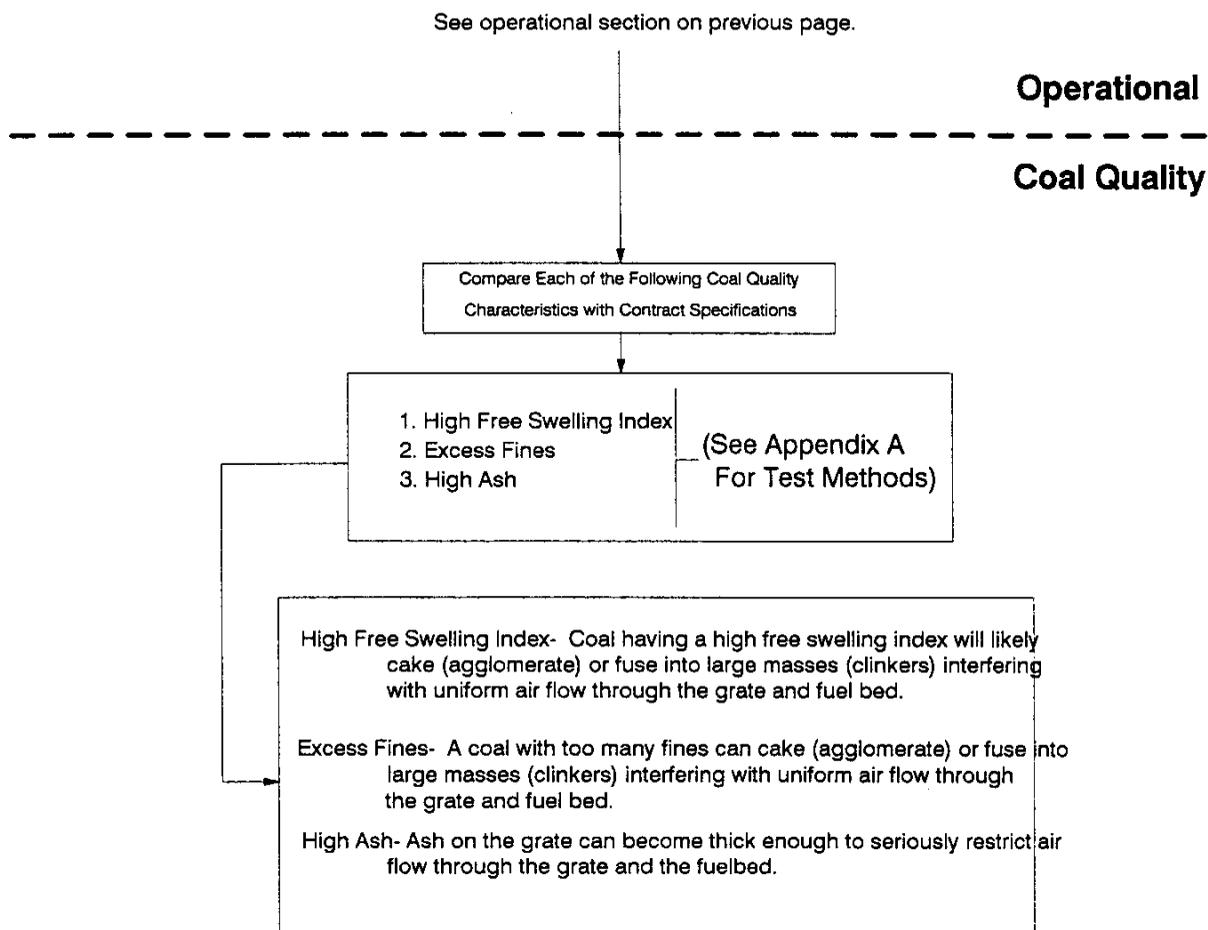


FIG2-58n/2

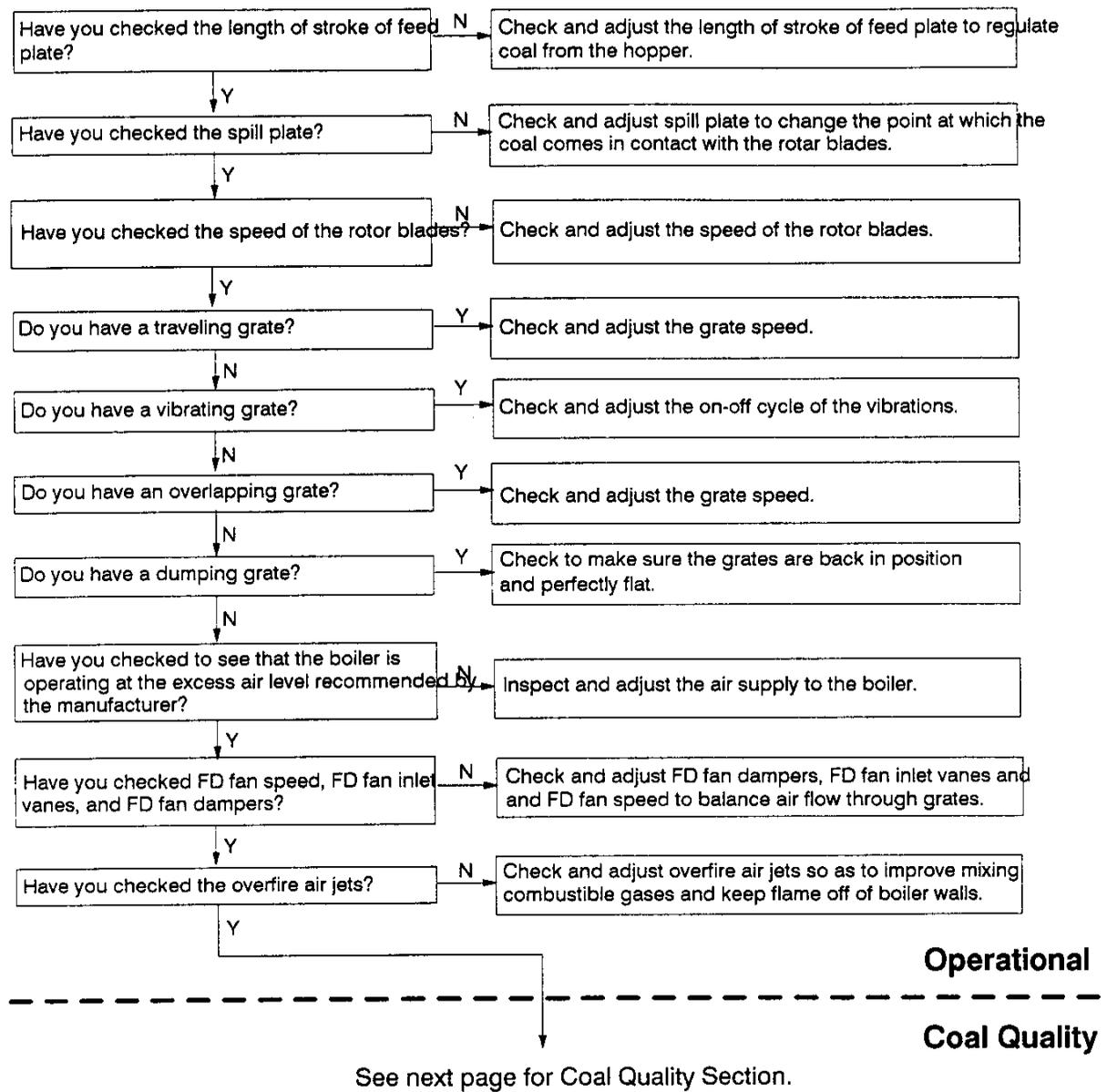
**FIGURE 2-59: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pressure Across The Grates**



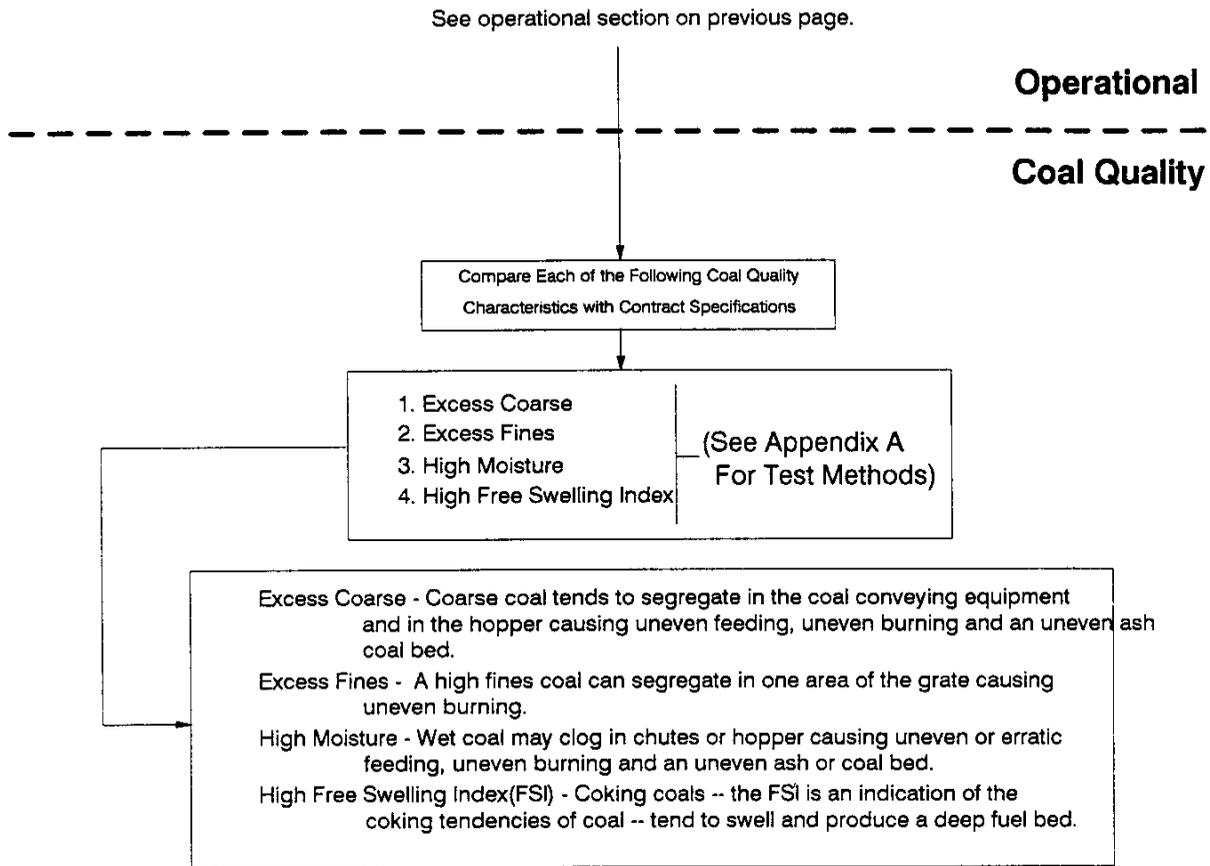
**FIGURE 2-59 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Pressure Across The Grates**



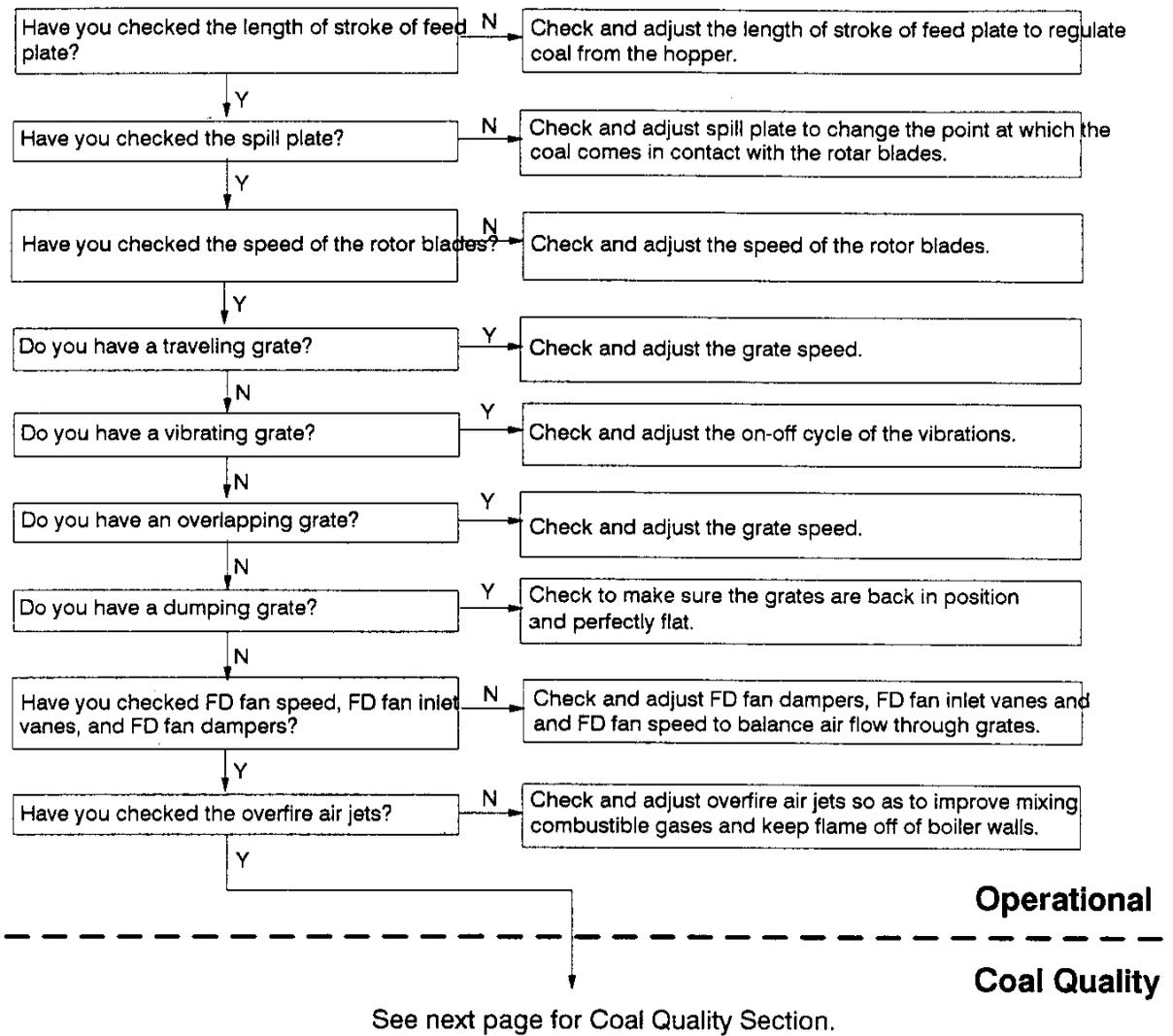
**FIGURE 2-60: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Ash Bed On Grate**



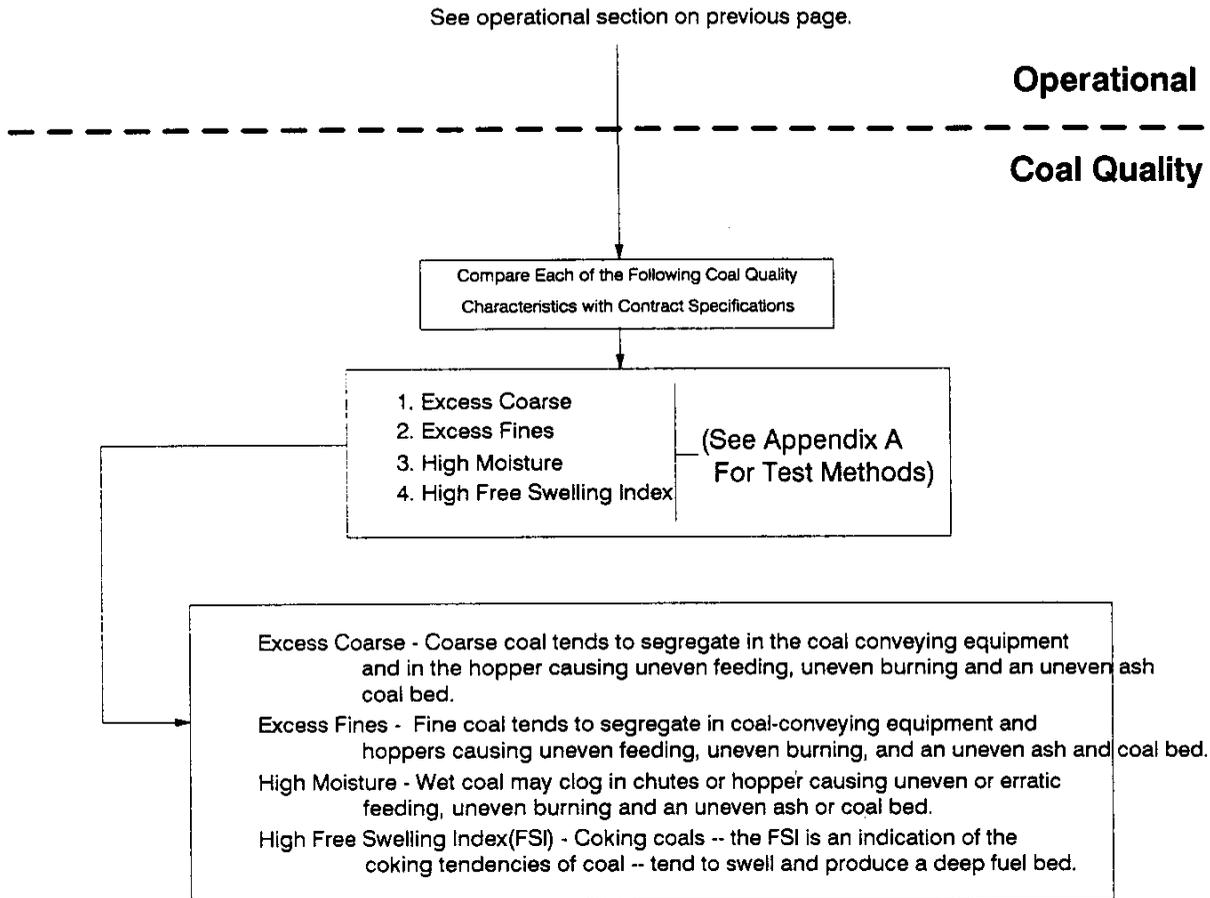
**FIGURE 2-60 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Ash Bed On Grate**



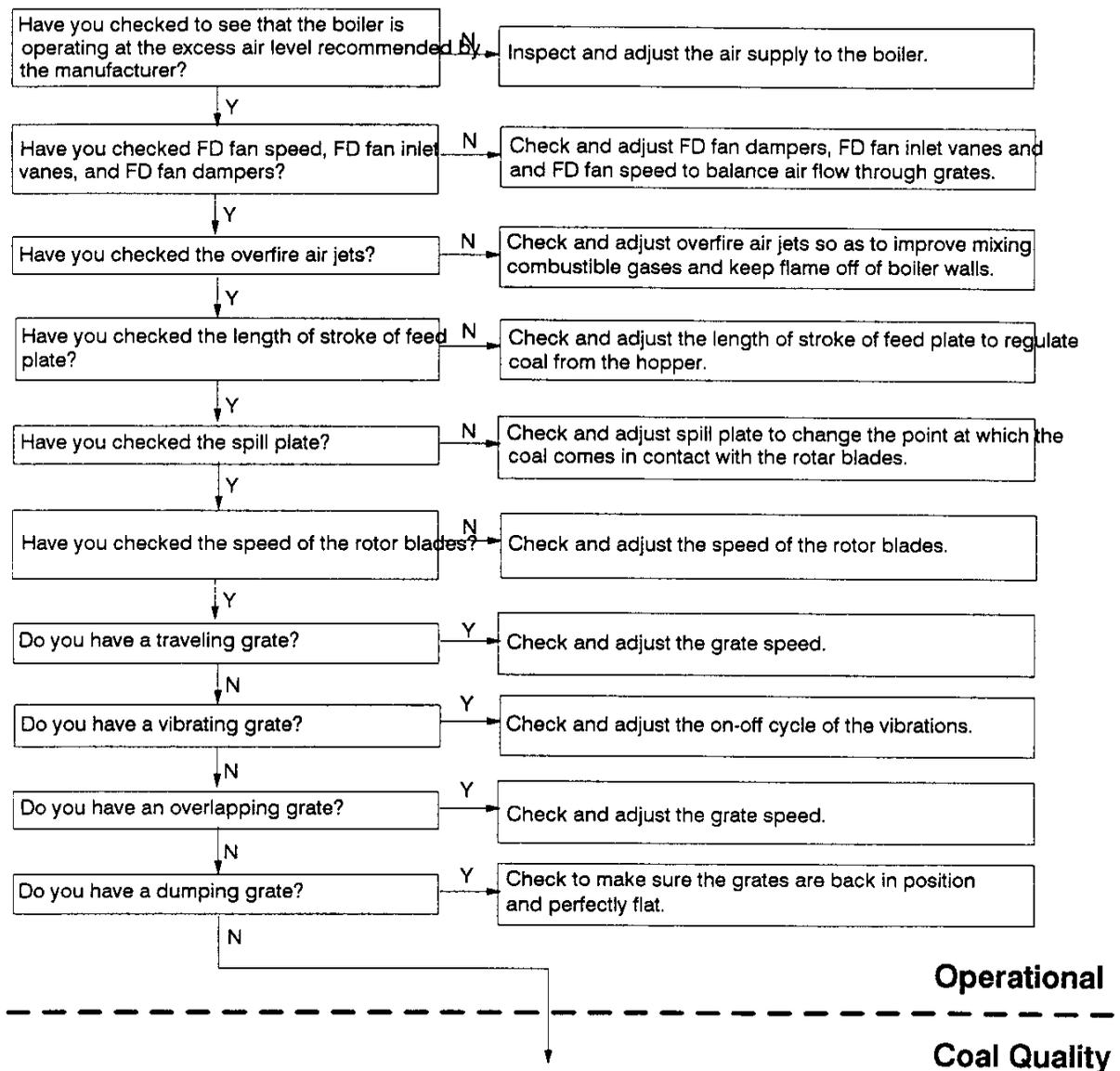
**FIGURE 2-61: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Coal Bed On The Grate**



**FIGURE 2-61 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Coal Bed On The Grate**

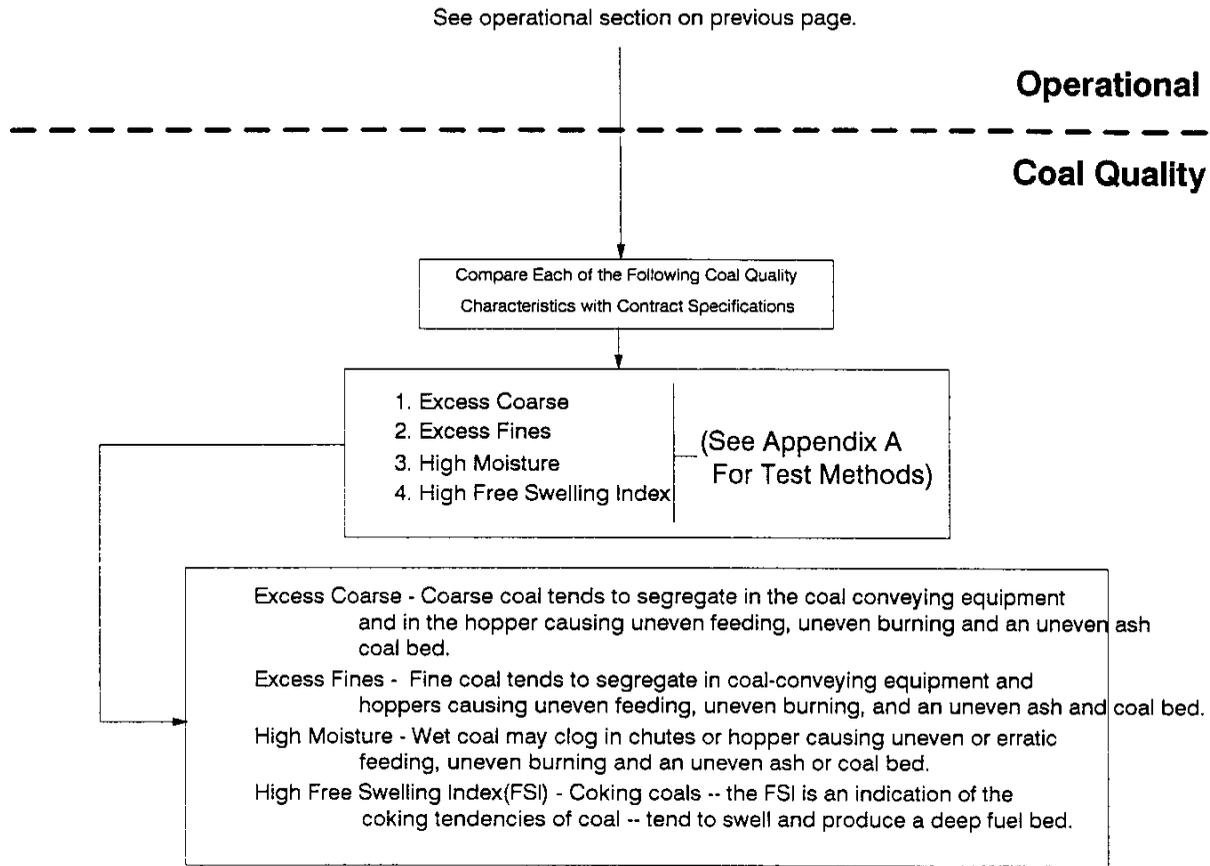


**FIGURE 2-62: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Burning On the Grate**

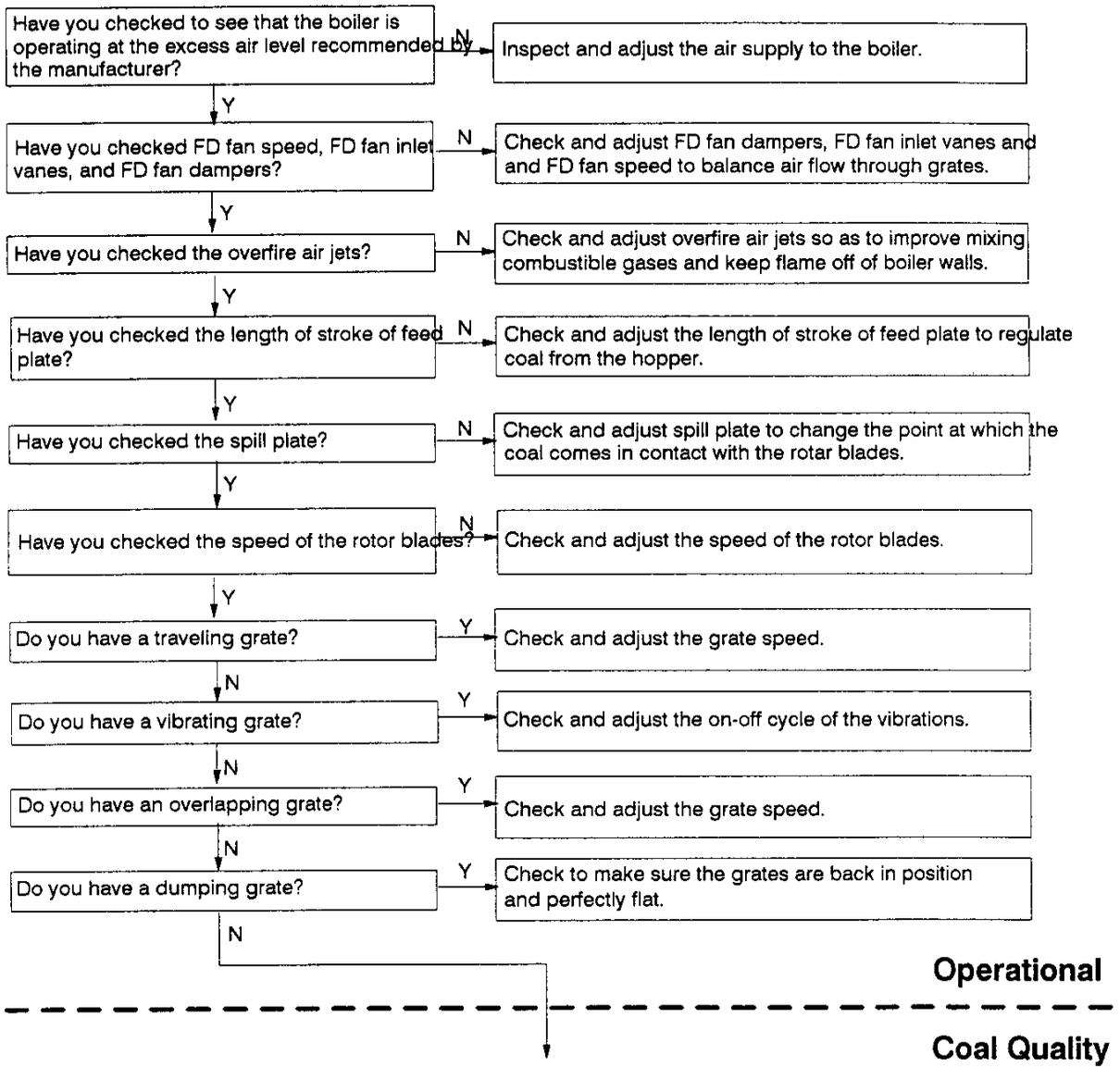


See next page for Coal Quality Section.

**FIGURE 2-62 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Uneven Burning On The Grate**

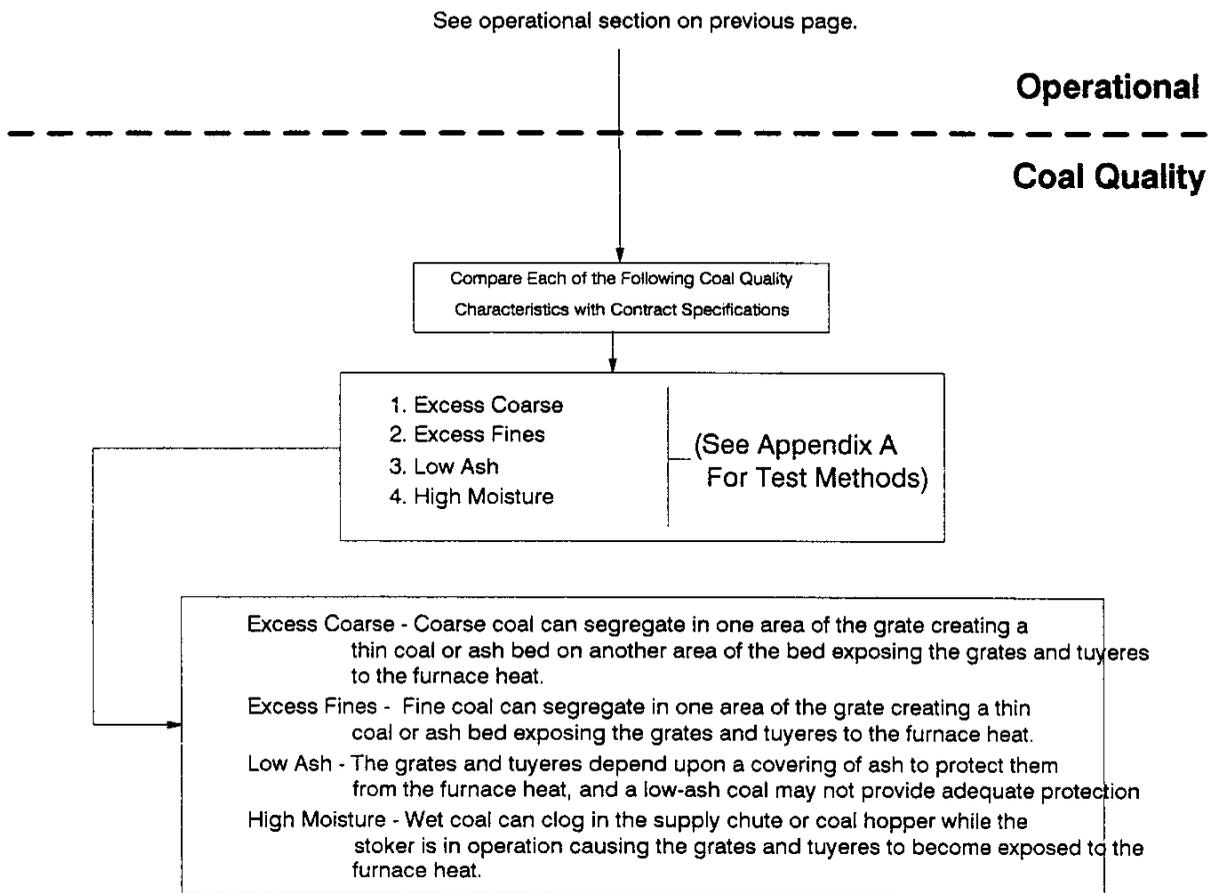


**FIGURE 2-63: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Warped, Burnt, Cracked Grates**

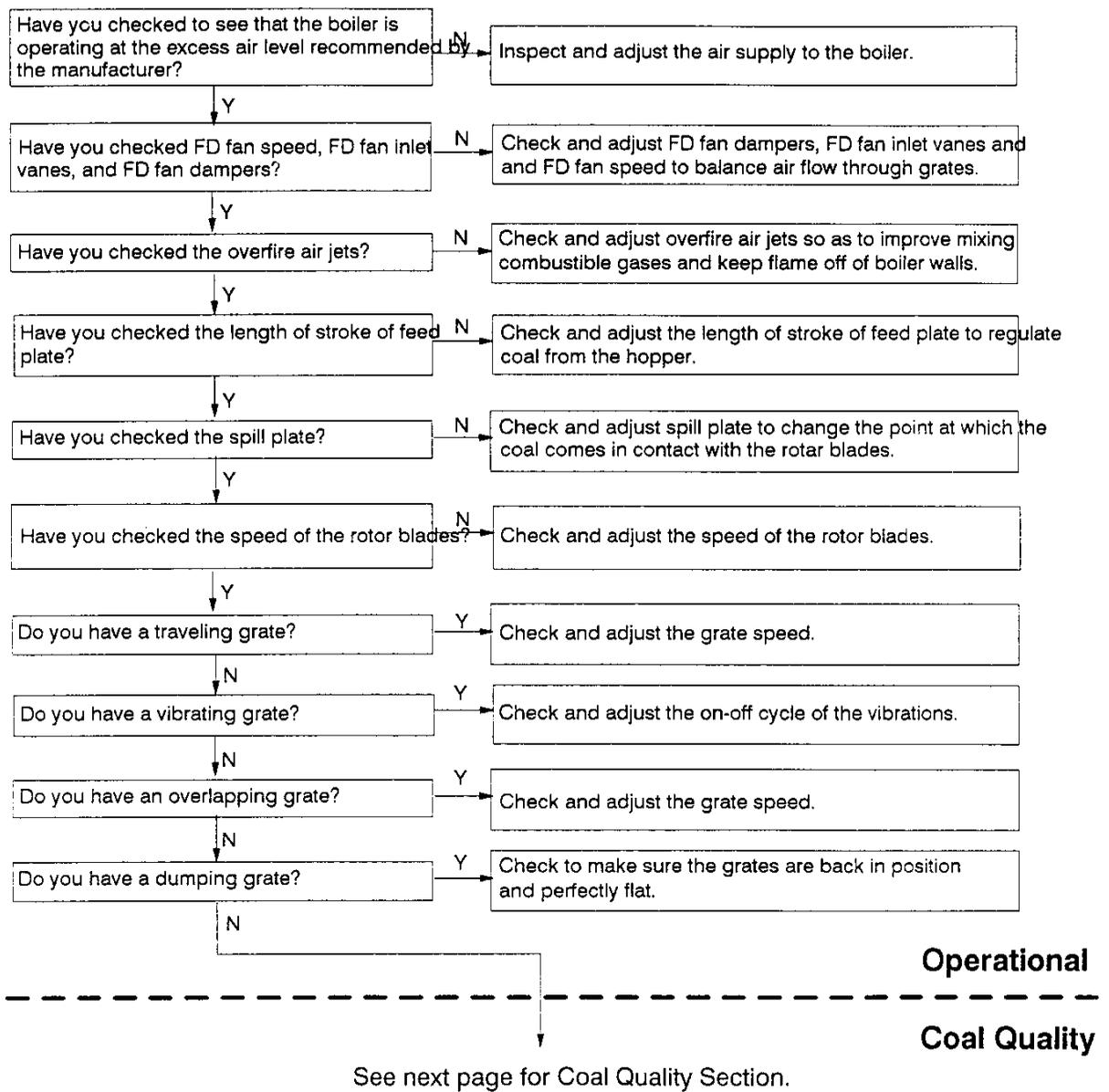


See next page for Coal Quality Section.

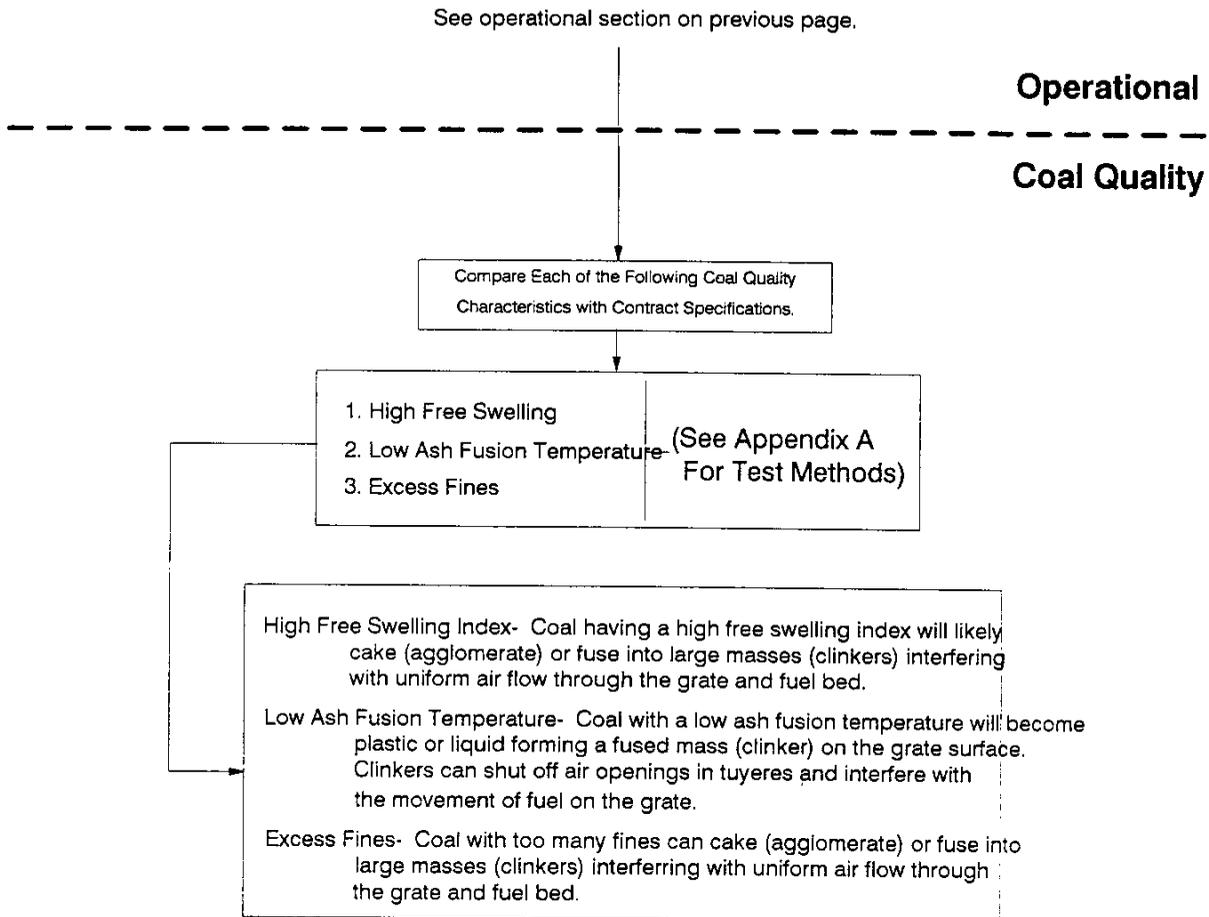
**FIGURE 2-63 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Warped, Burnt, Cracked Grates**



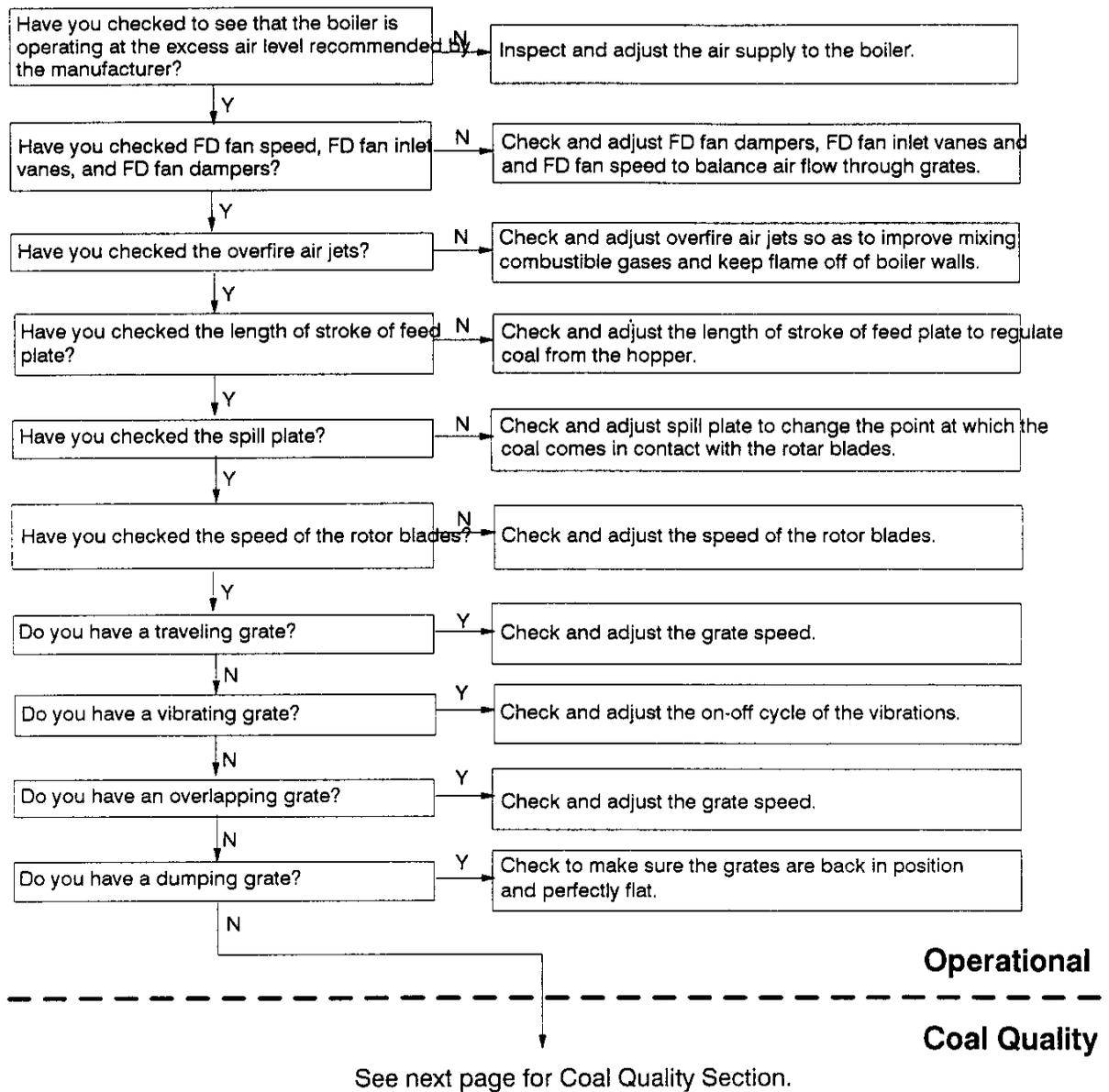
**FIGURE 2-64: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Clinkers Of The Grate**



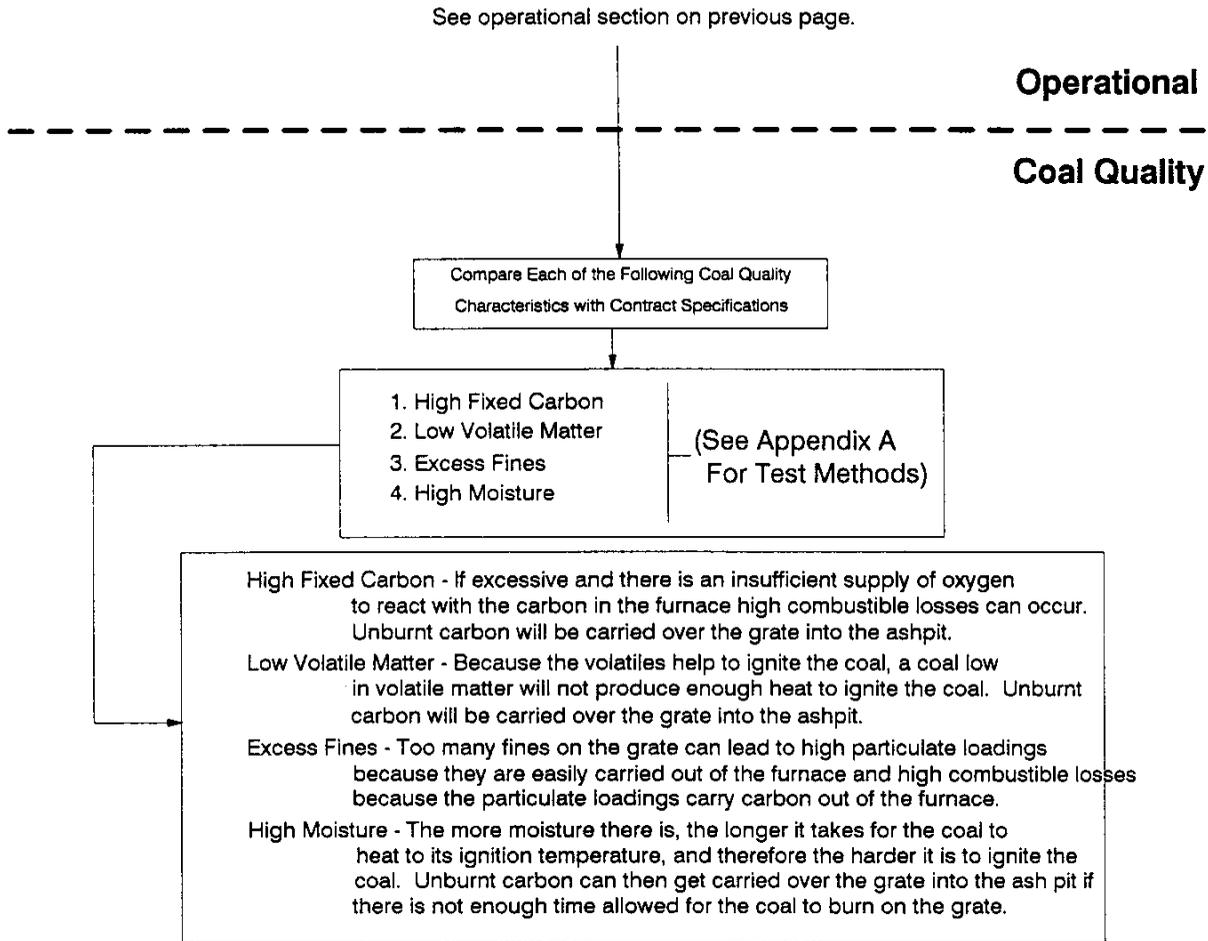
**FIGURE 2-64 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Clinkers Of The Grate**



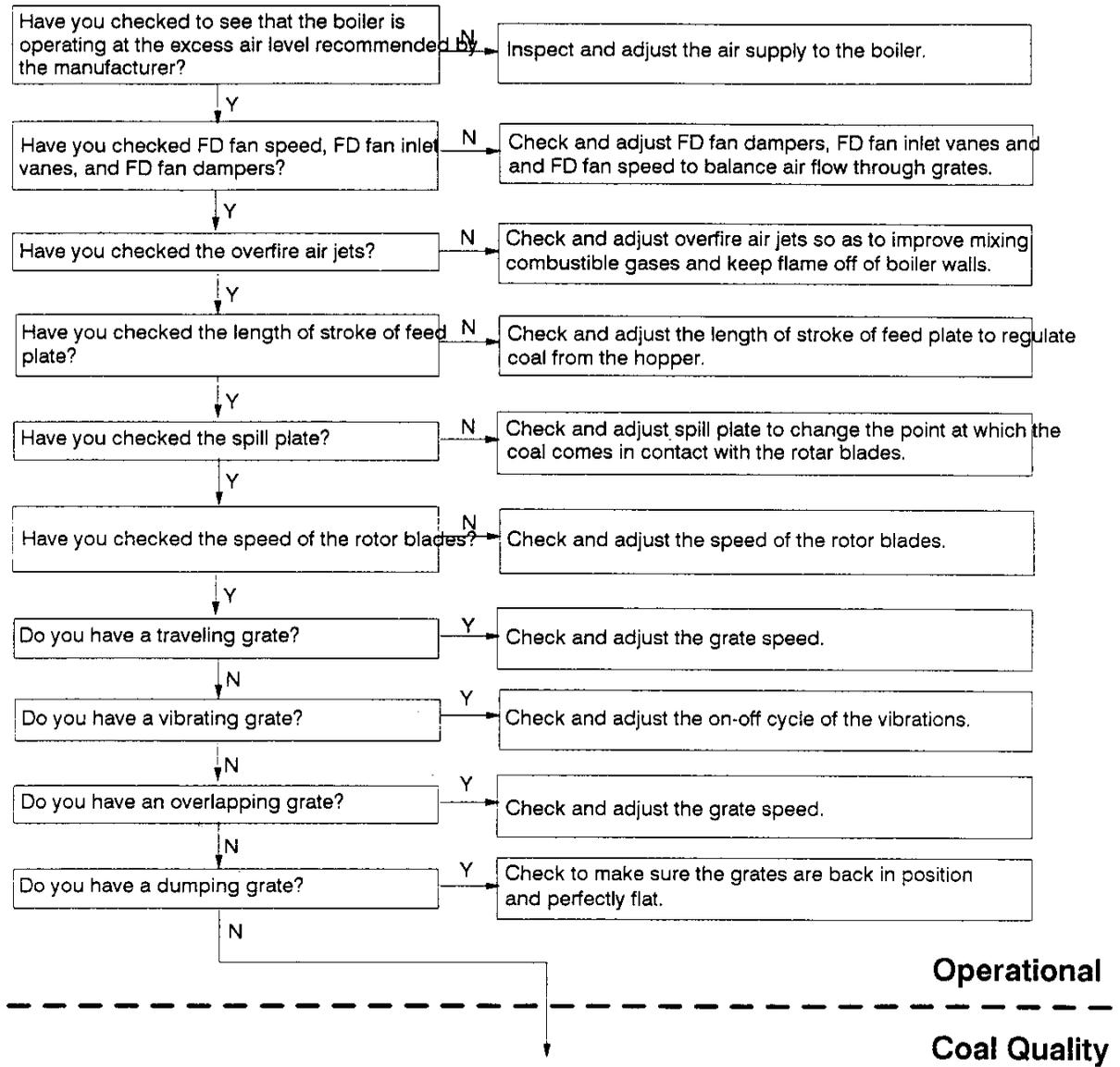
**FIGURE 2-65: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout On The Grate**



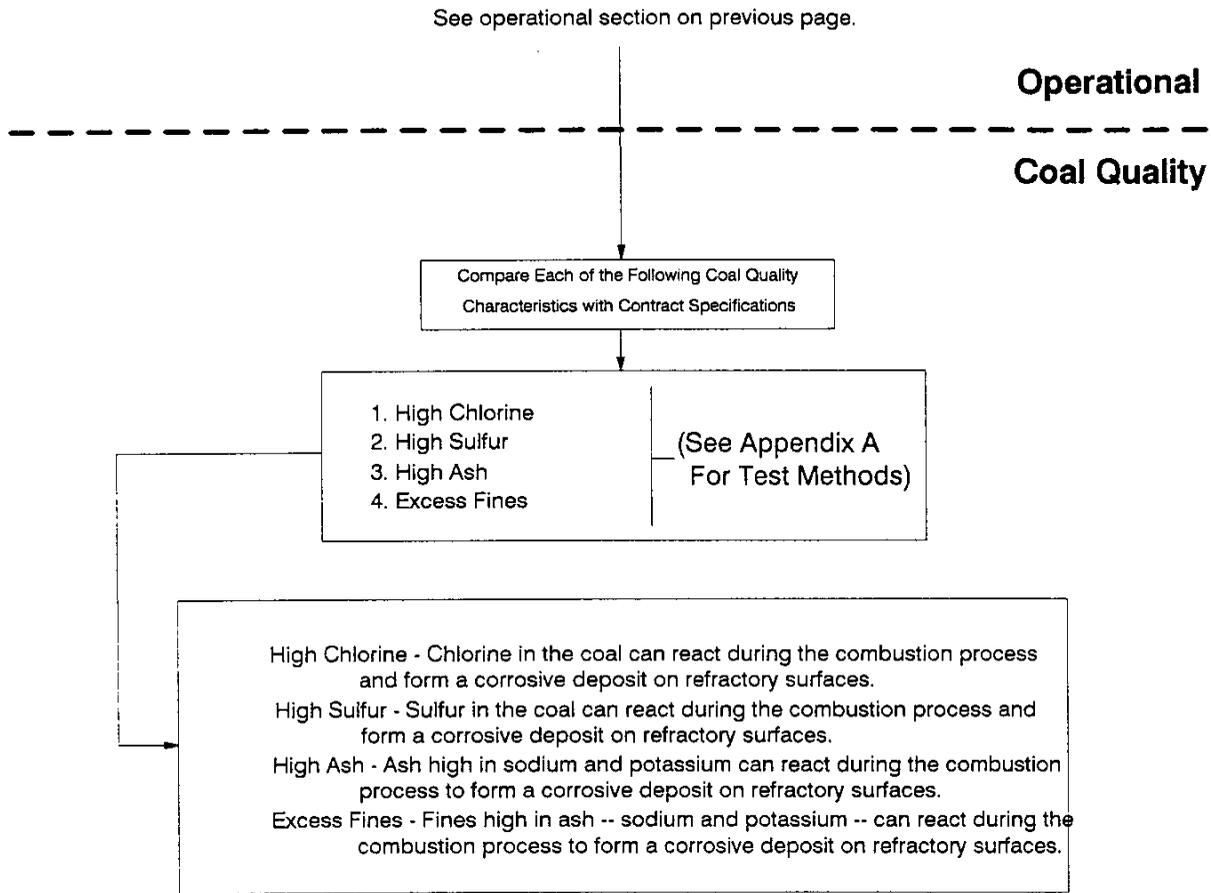
**FIGURE 2-65 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout On The Grate**



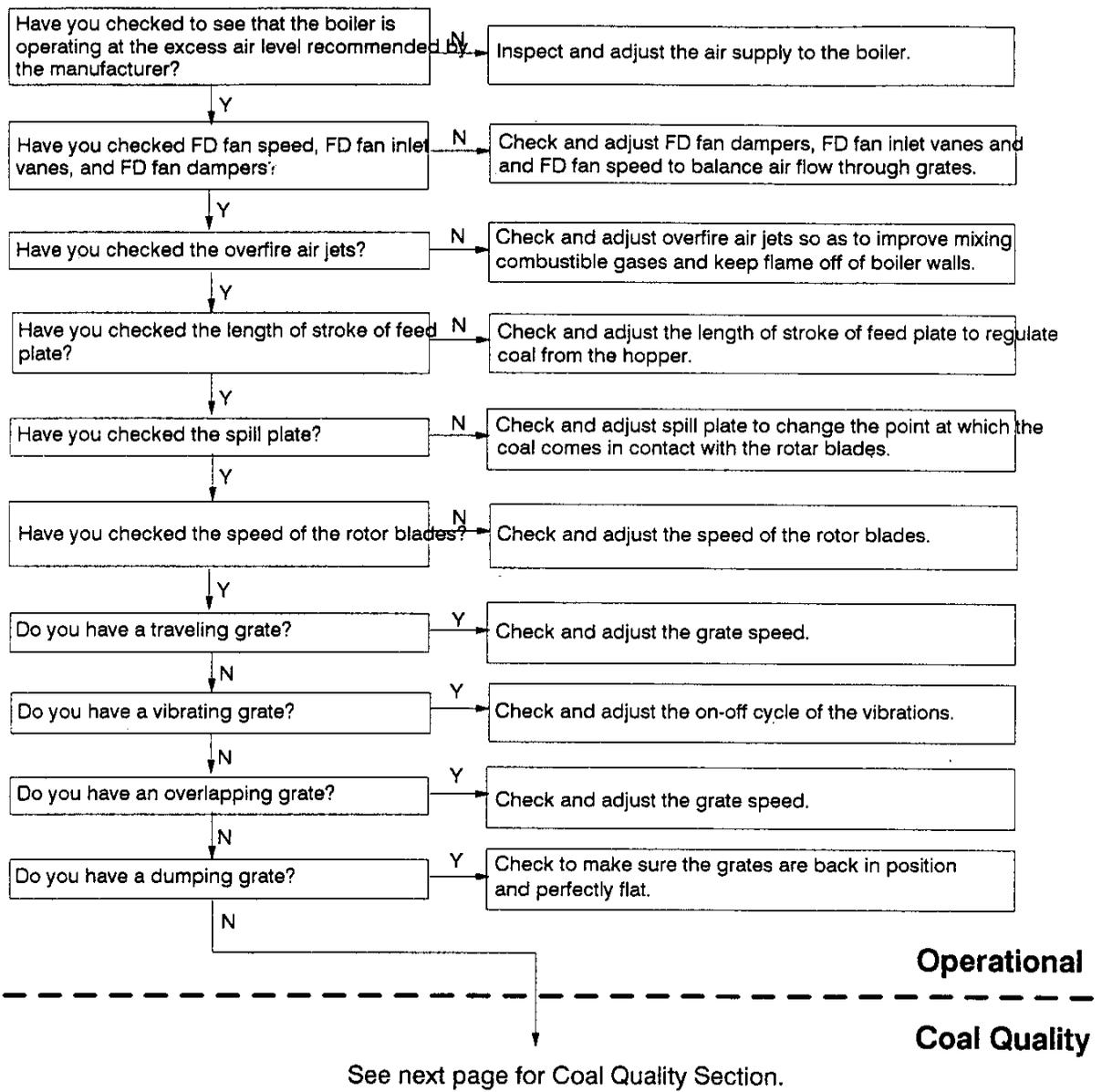
**FIGURE 2-66: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Refractory Surfaces**



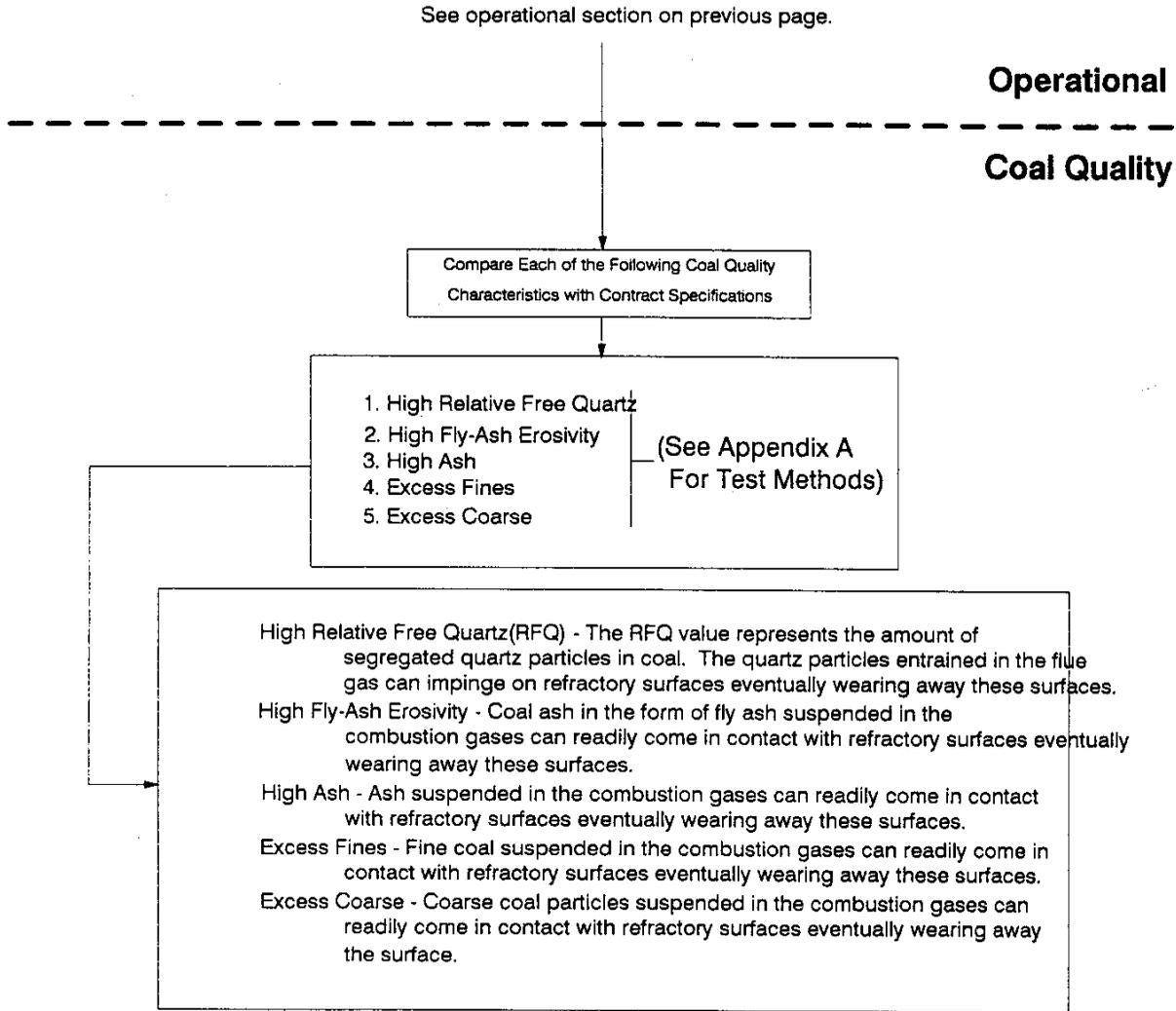
**FIGURE 2-66 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Refractory Surfaces**



**FIGURE 2-67: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Refractory Surfaces**



**FIGURE 2-67 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Refractory Surfaces**



**FIGURE 2-68: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Slagging/Spalling Of The Boiler Components
(Refractory Surfaces)**

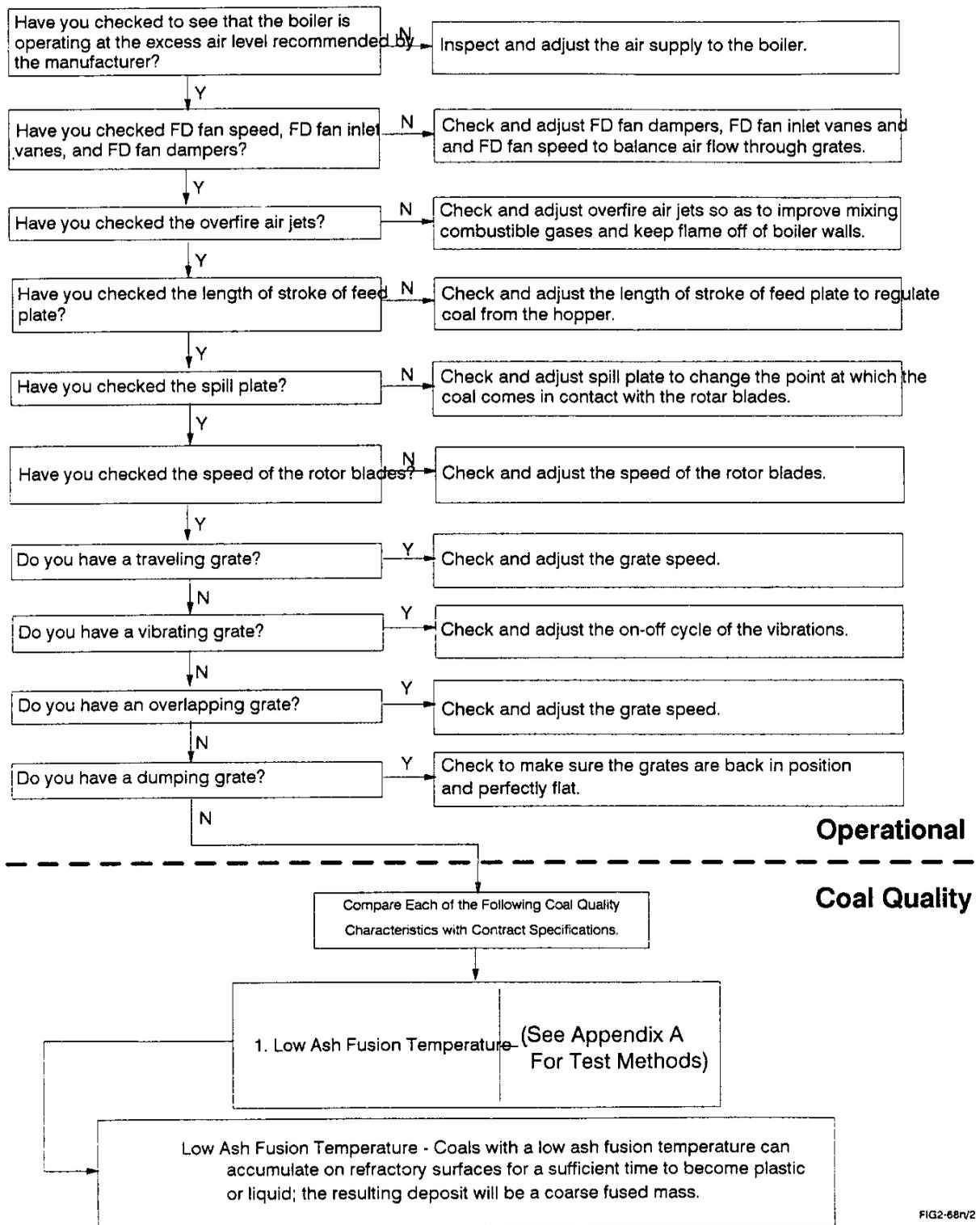
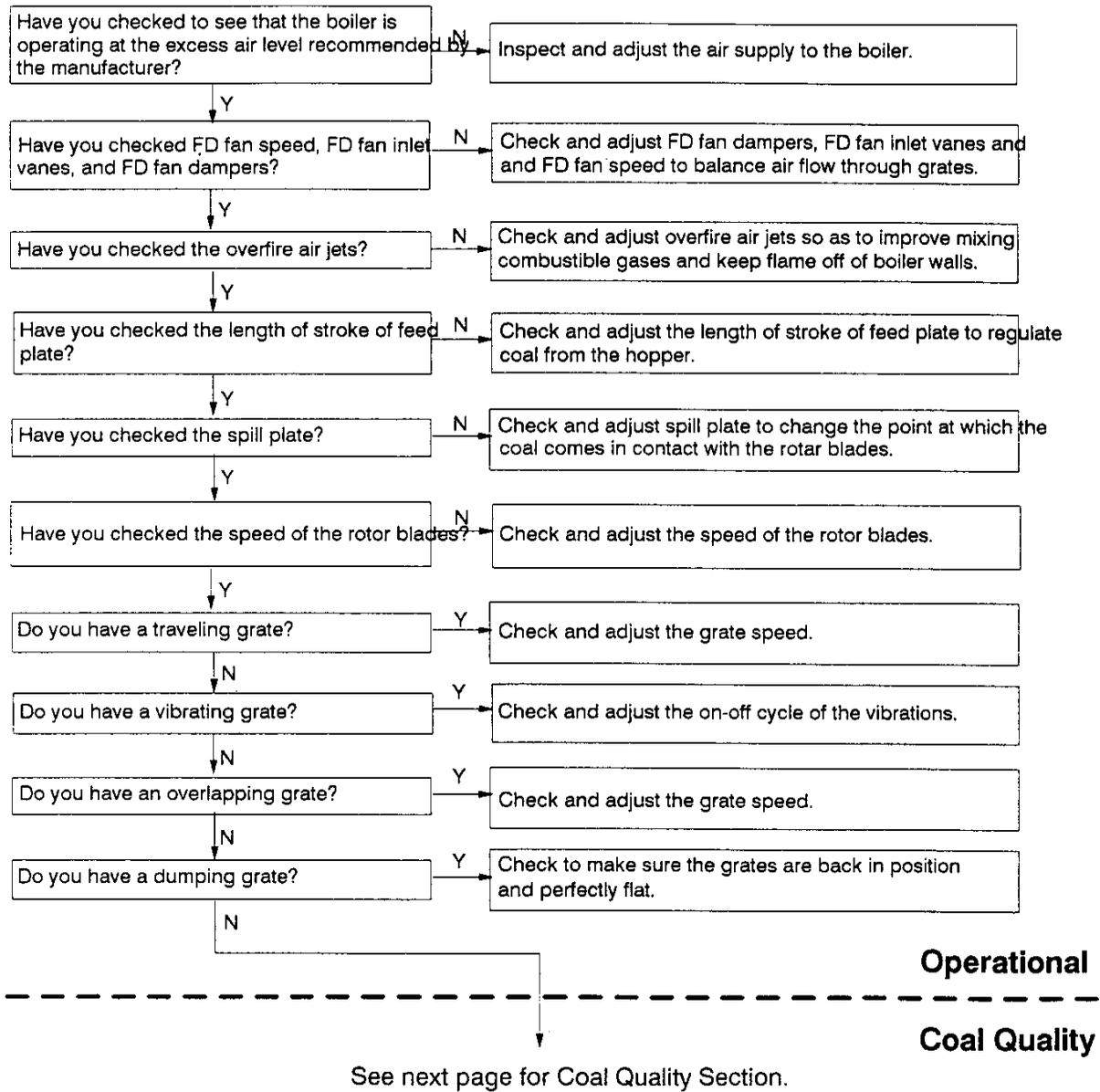
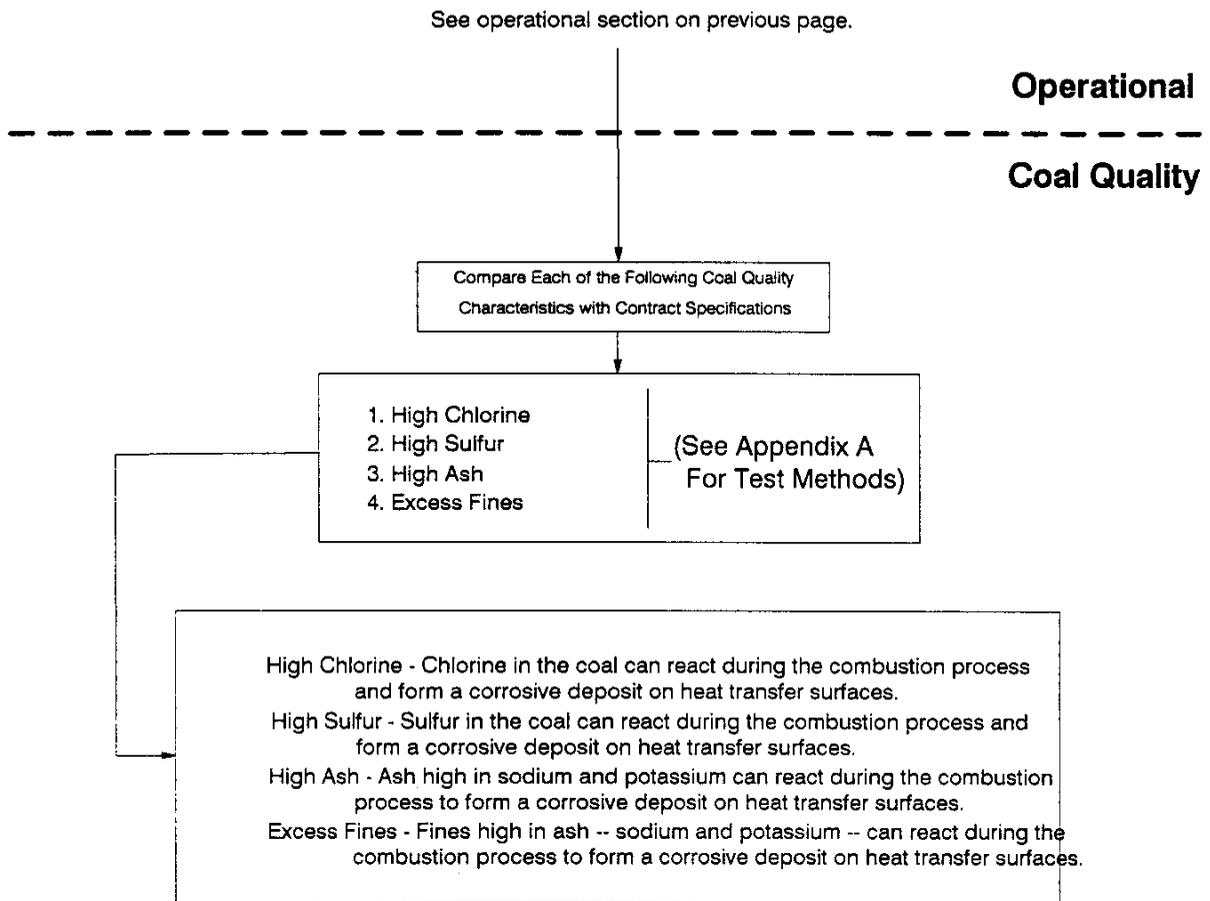


FIG2-68v2

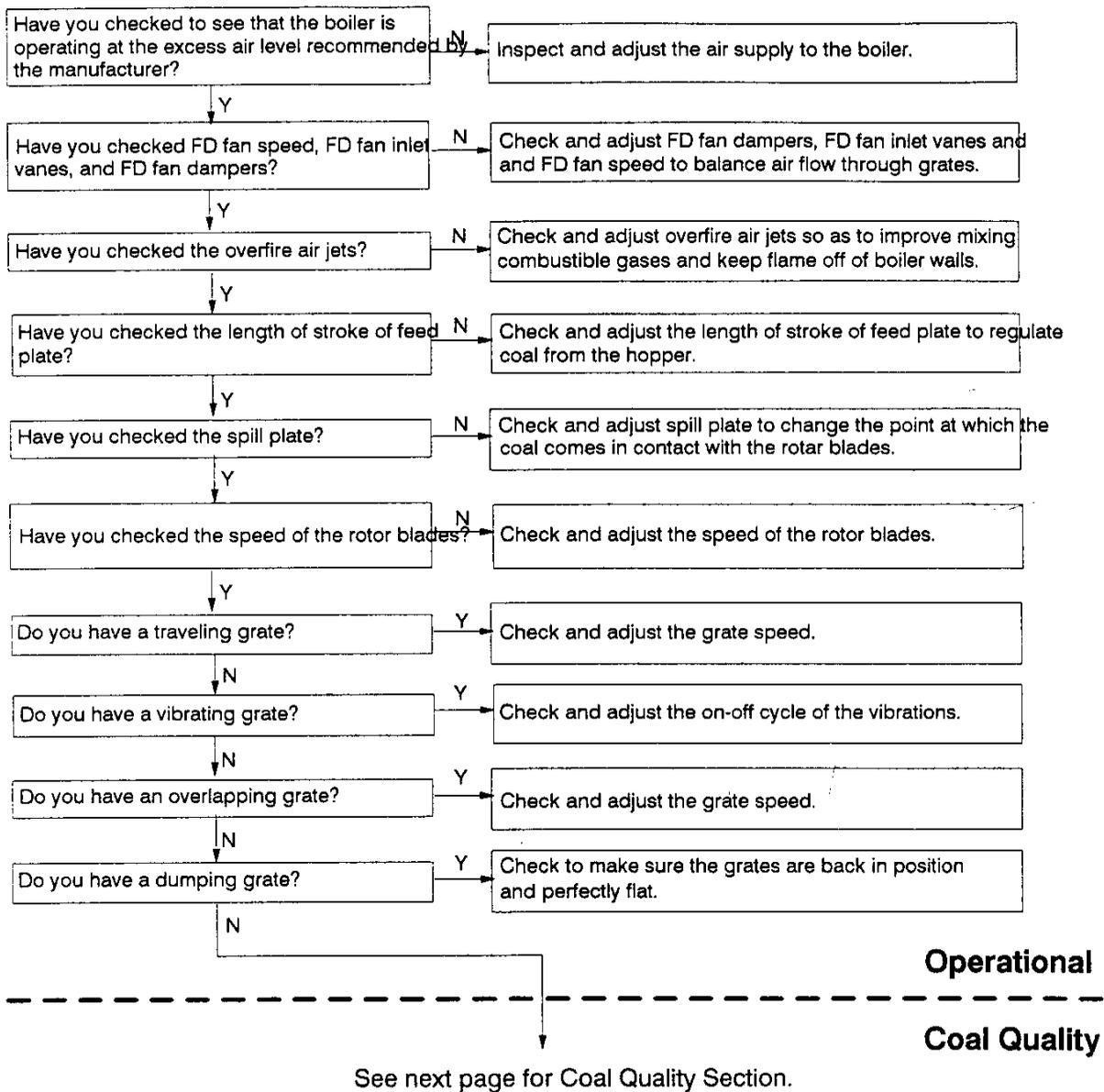
**FIGURE 2-69: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



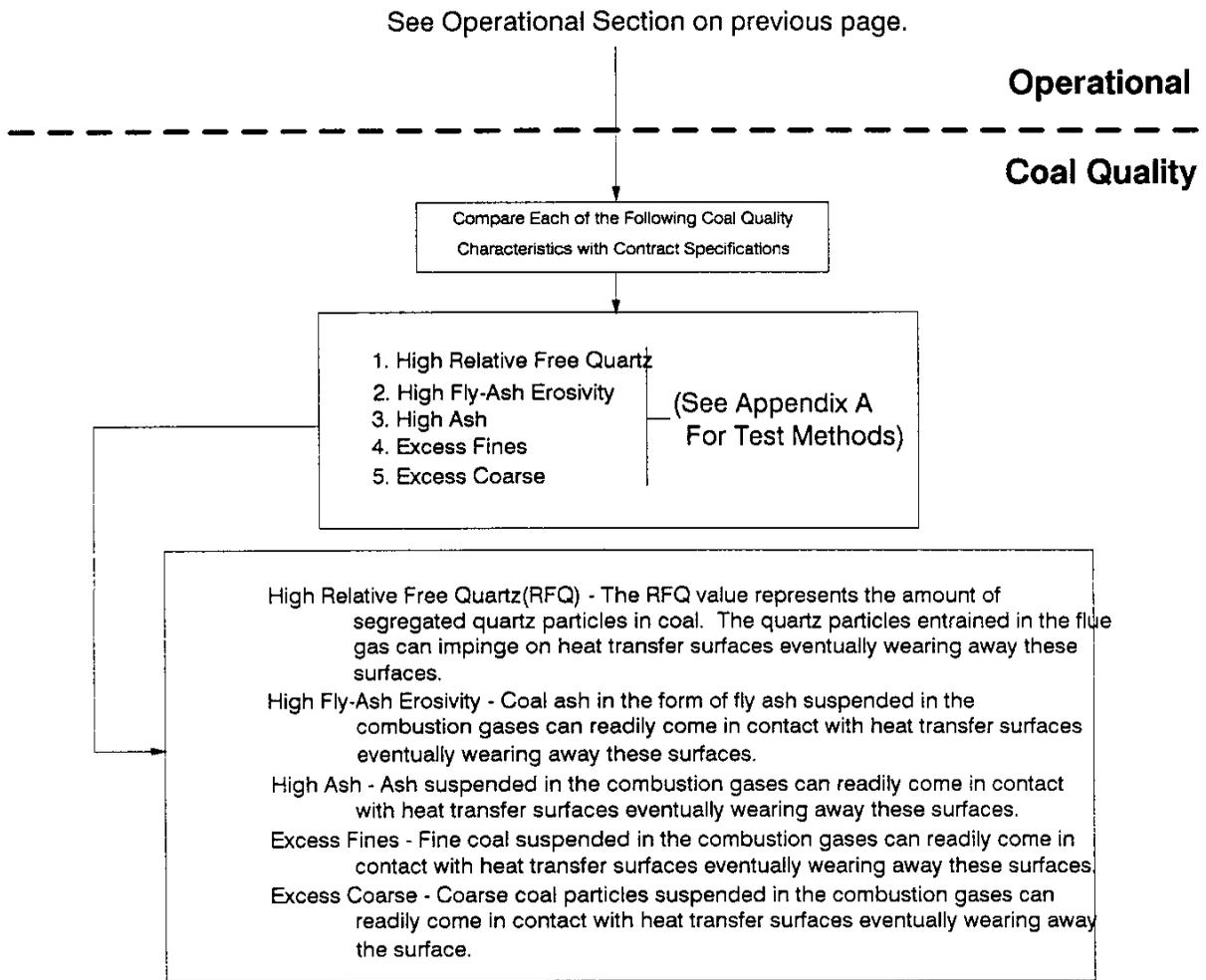
**FIGURE 2-69 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



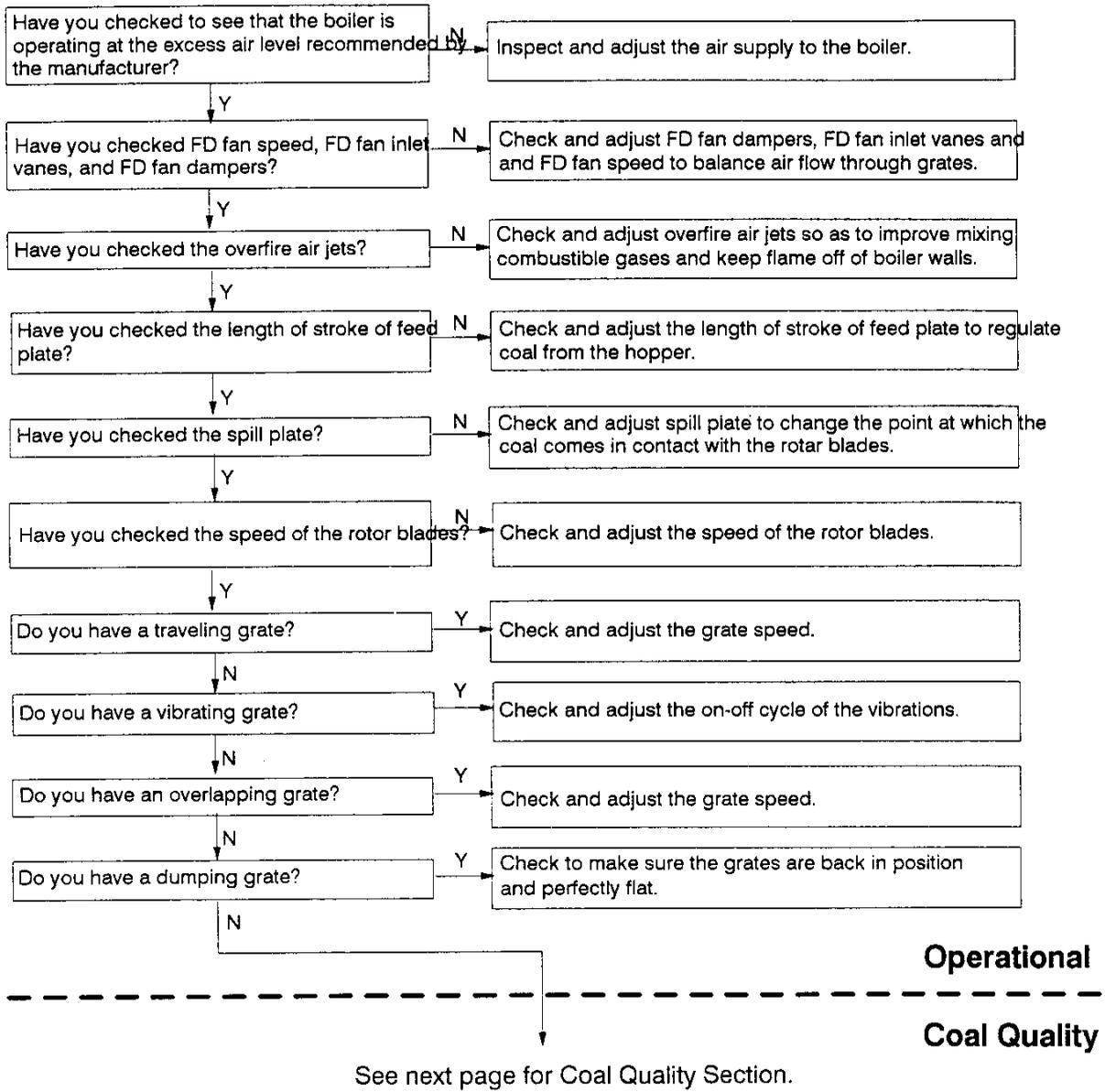
**FIGURE 2-70: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



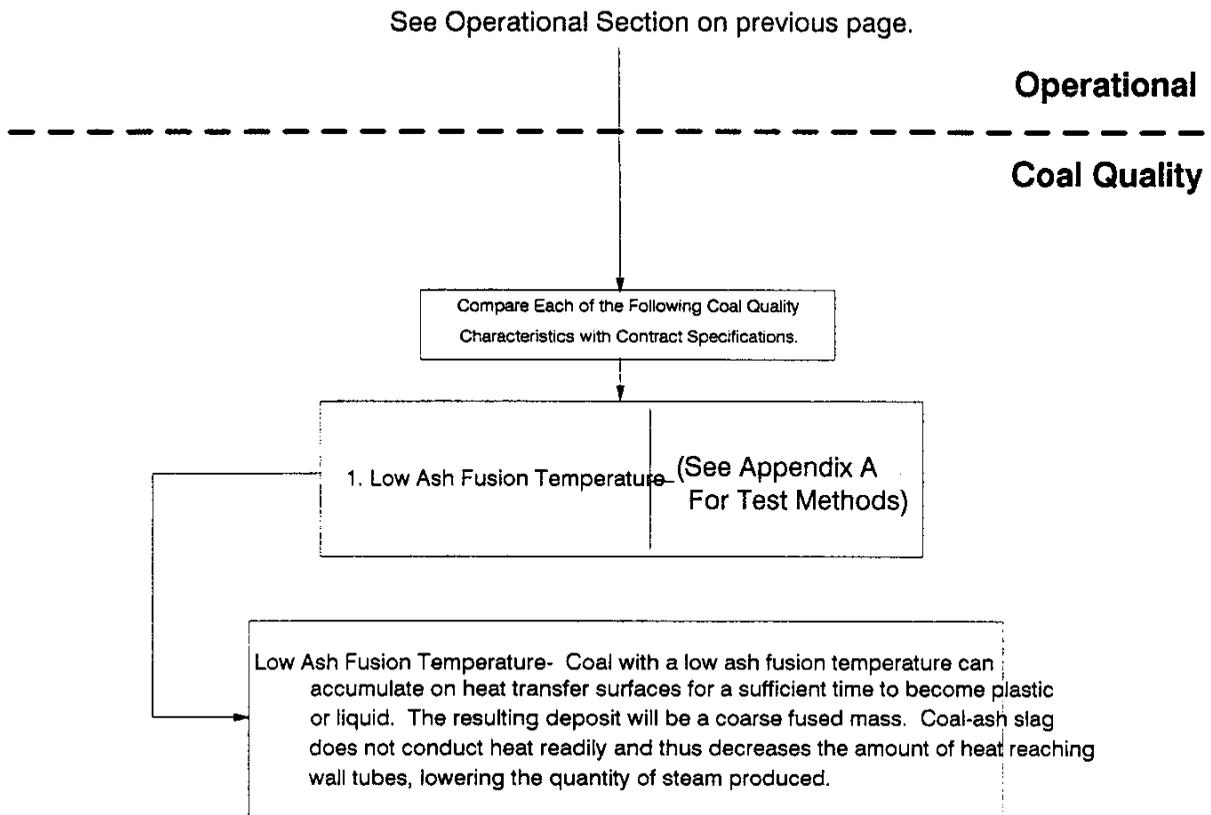
**FIGURE 2-70 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



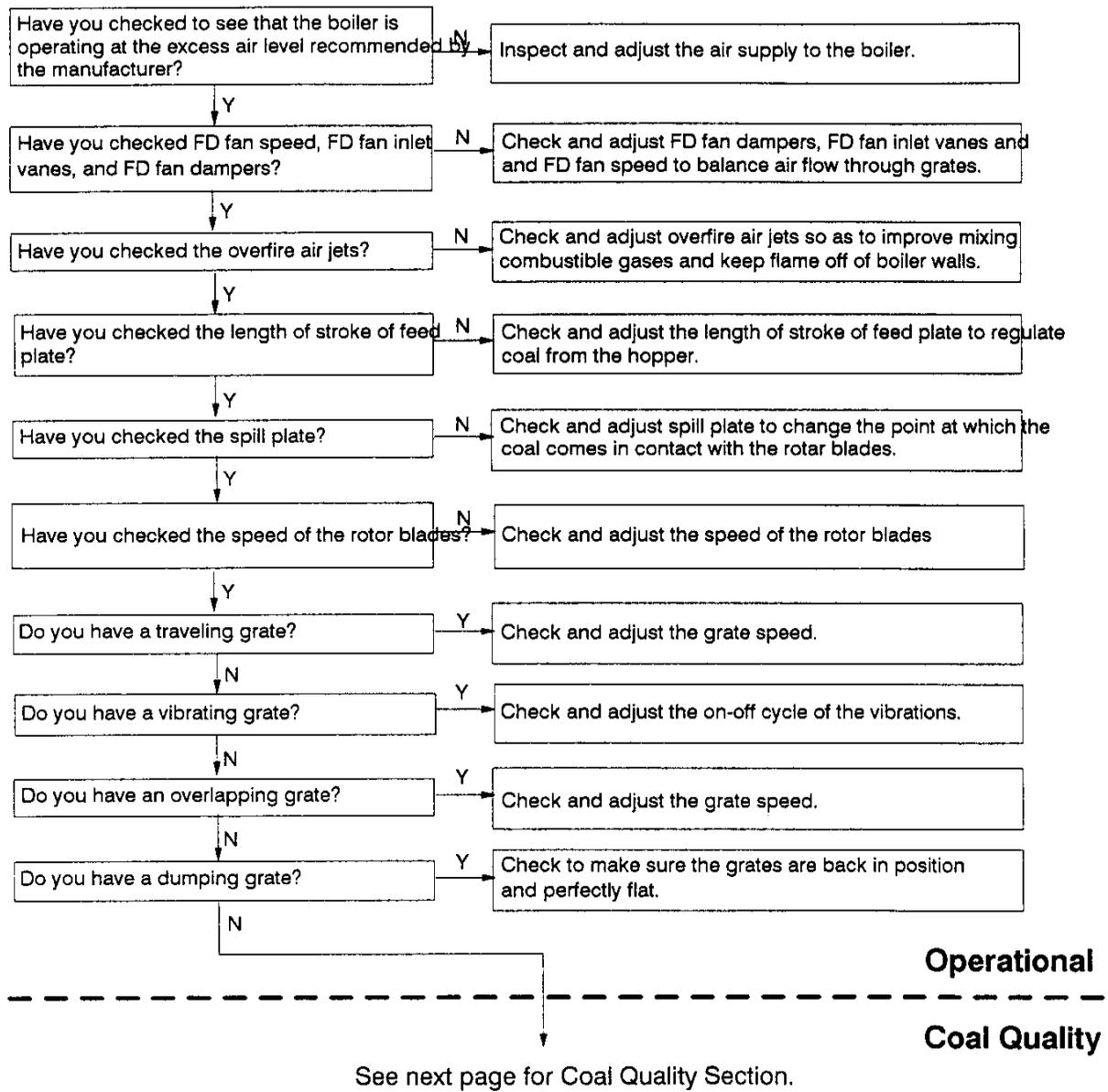
**FIGURE 2-71: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Slagging Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



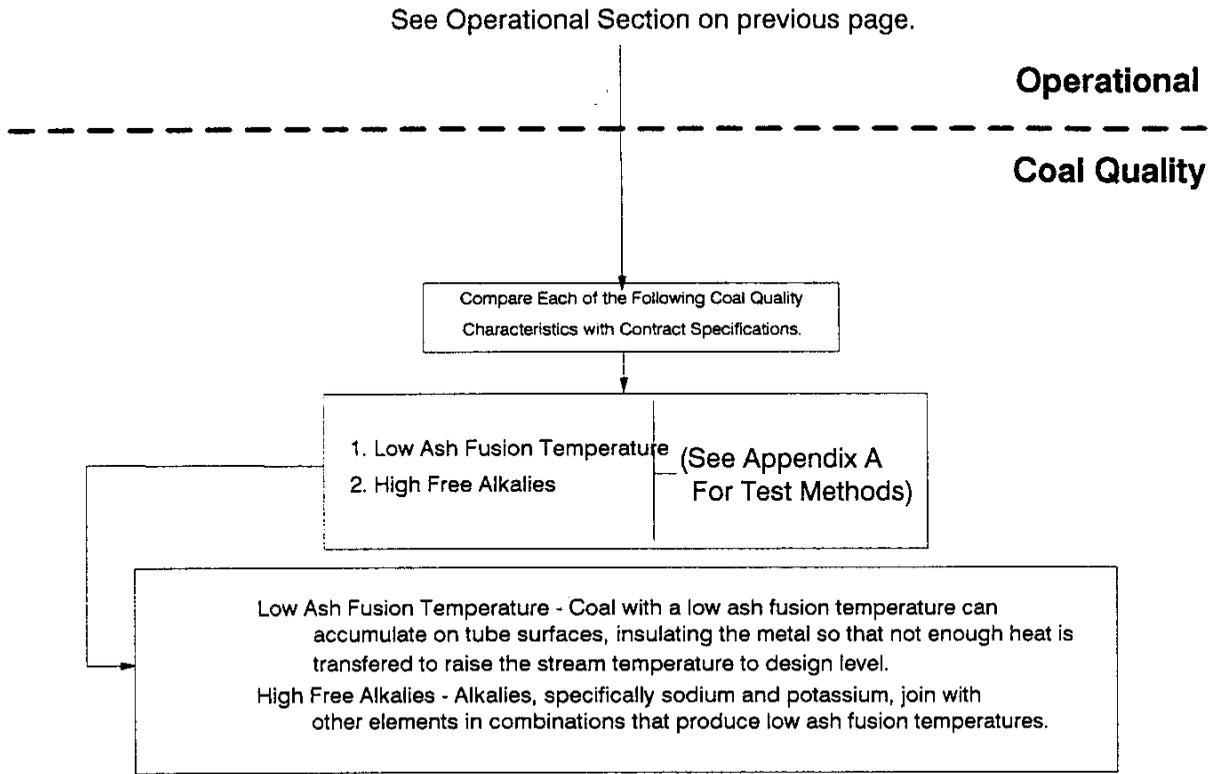
**FIGURE 2-71 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Slagging Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



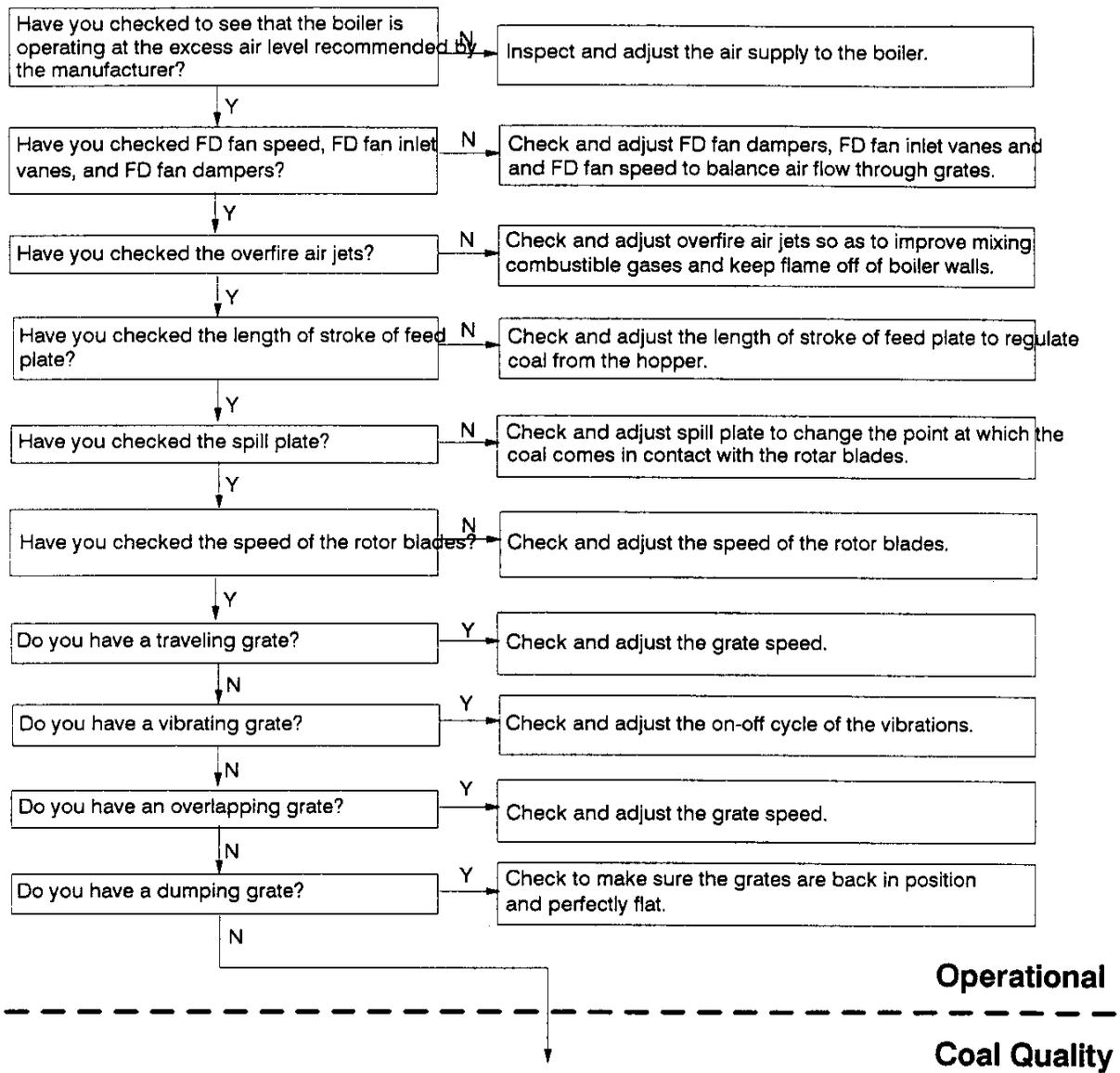
**FIGURE 2-72: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Fouling Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**



**FIGURE 2-72 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Fouling Of Heat Transfer Surfaces
(Boiler Tubes and Water Walls)**

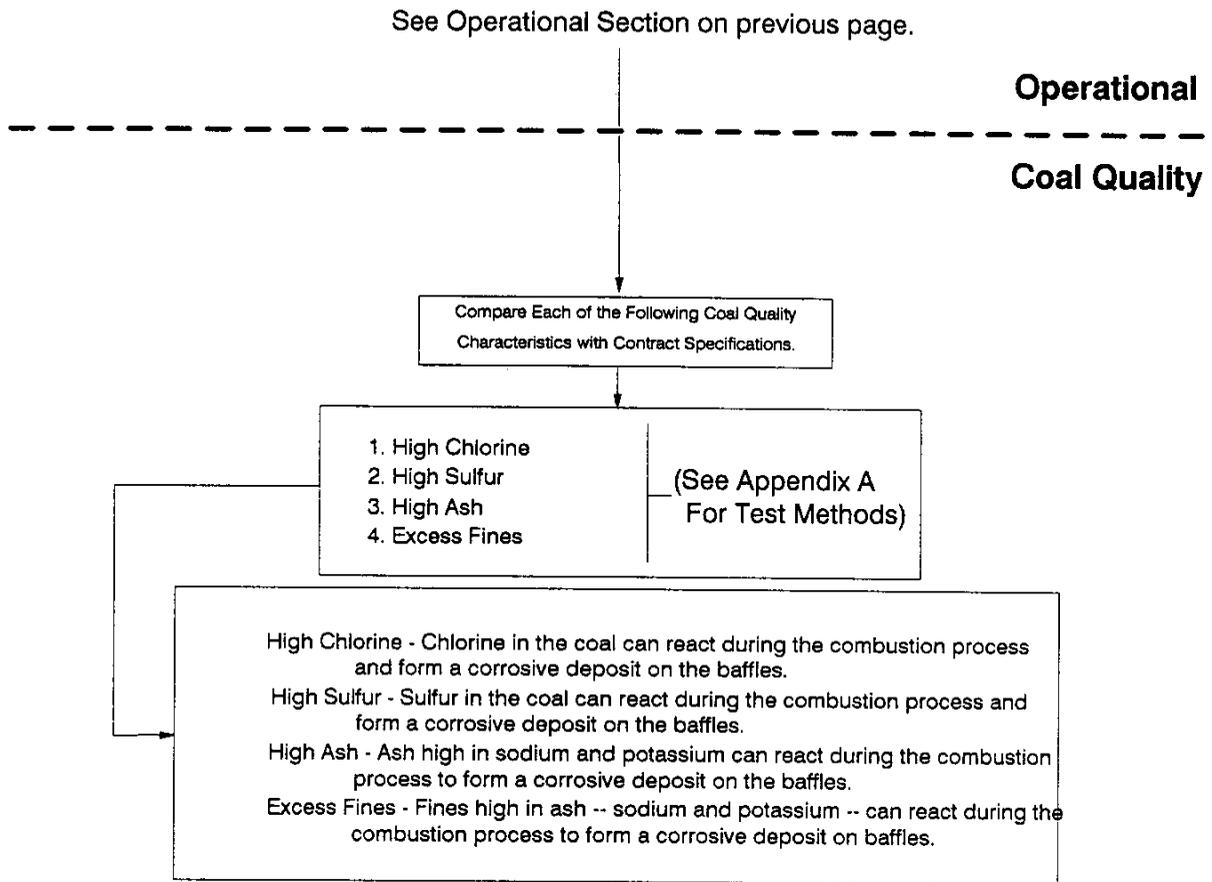


**FIGURE 2-73: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Baffles**

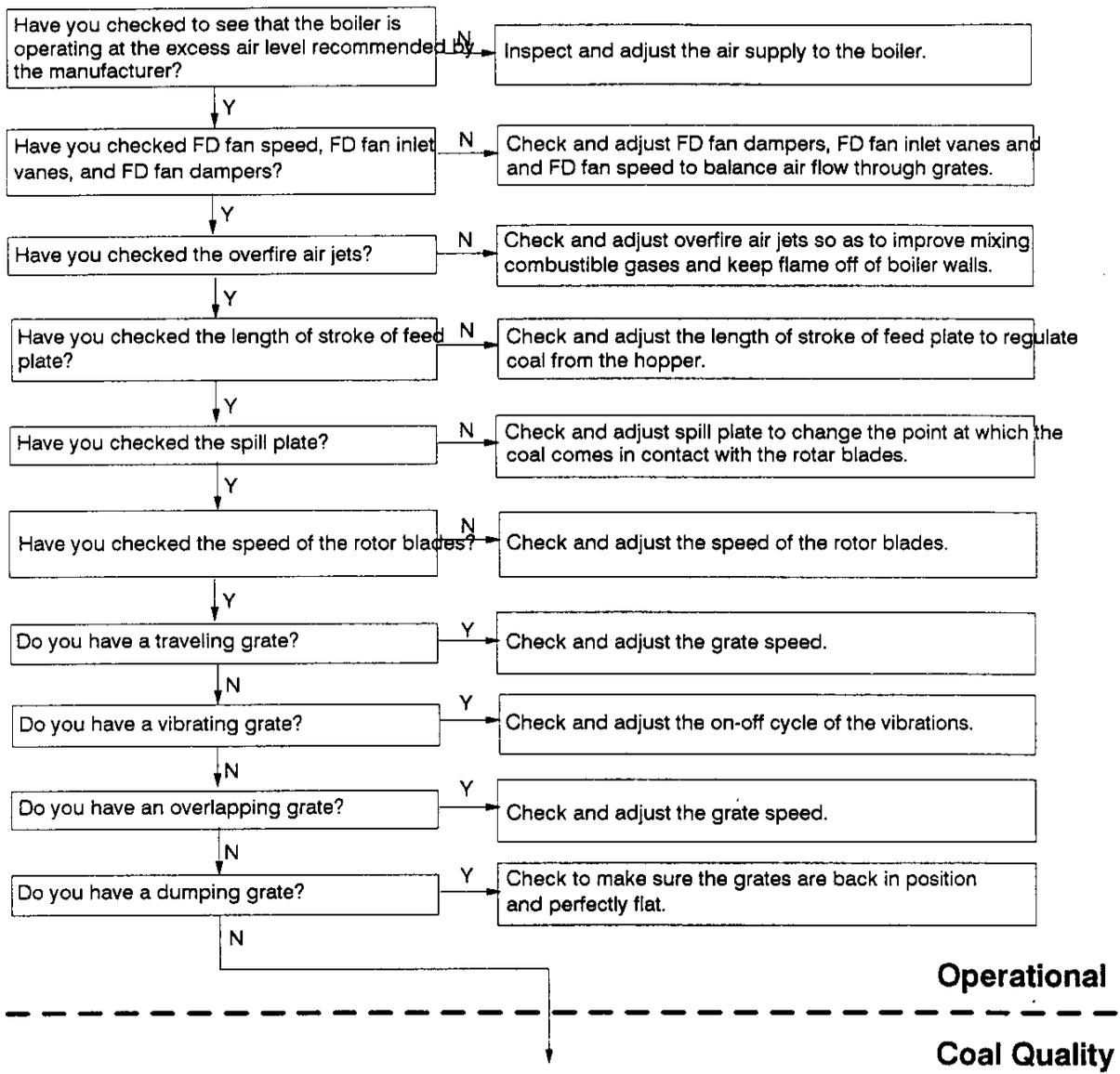


See next page for Coal Quality Section.

**FIGURE 2-73 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Baffles**



**FIGURE 2-74: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of Heat Transfer Surfaces
(Baffles)**

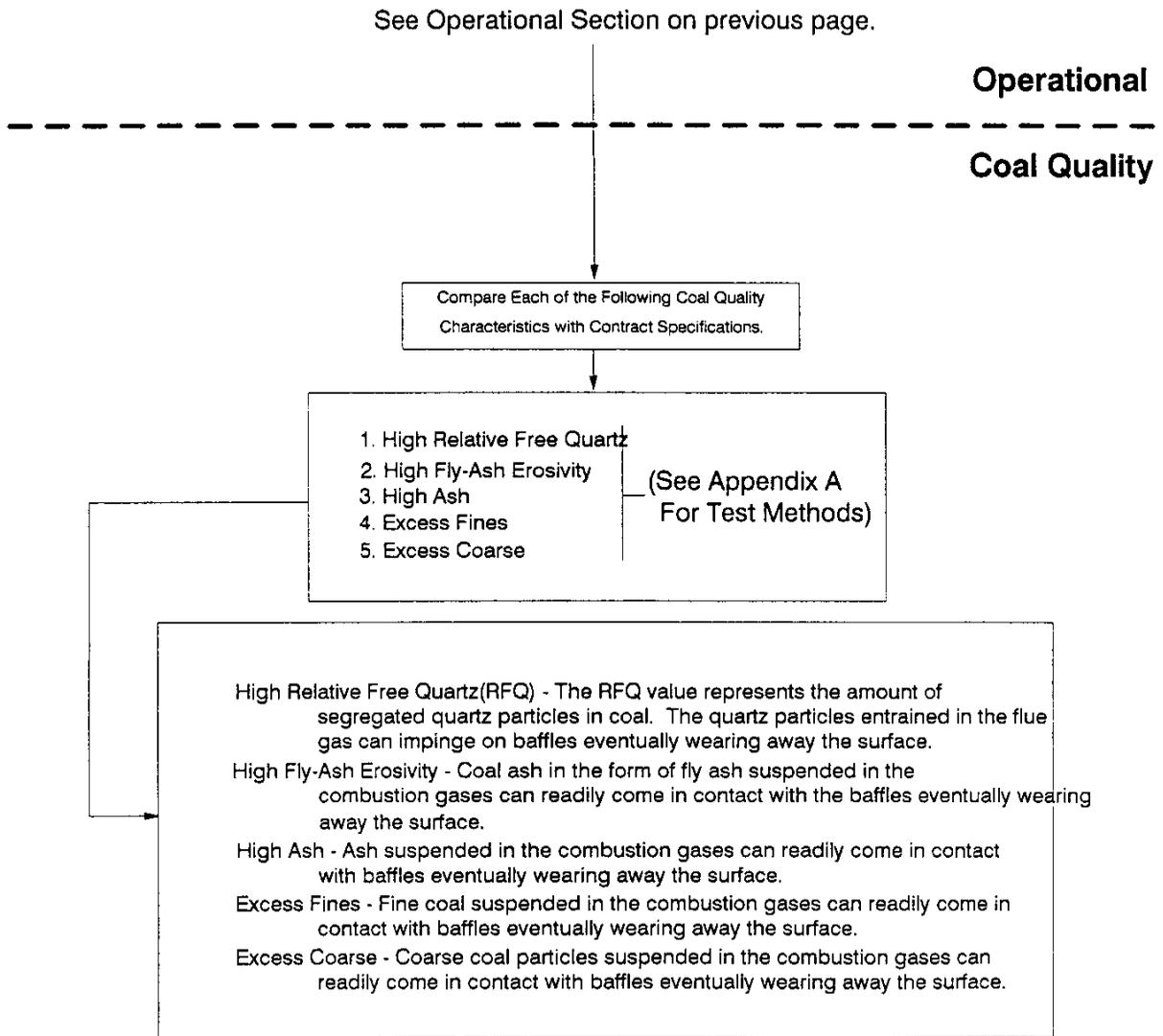


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**FIGURE 2-74 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of Heat Transfer Surfaces
(Baffles)**



**FIGURE 2-75: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Slagging Of Heat Transfer Surfaces
(Baffles)**

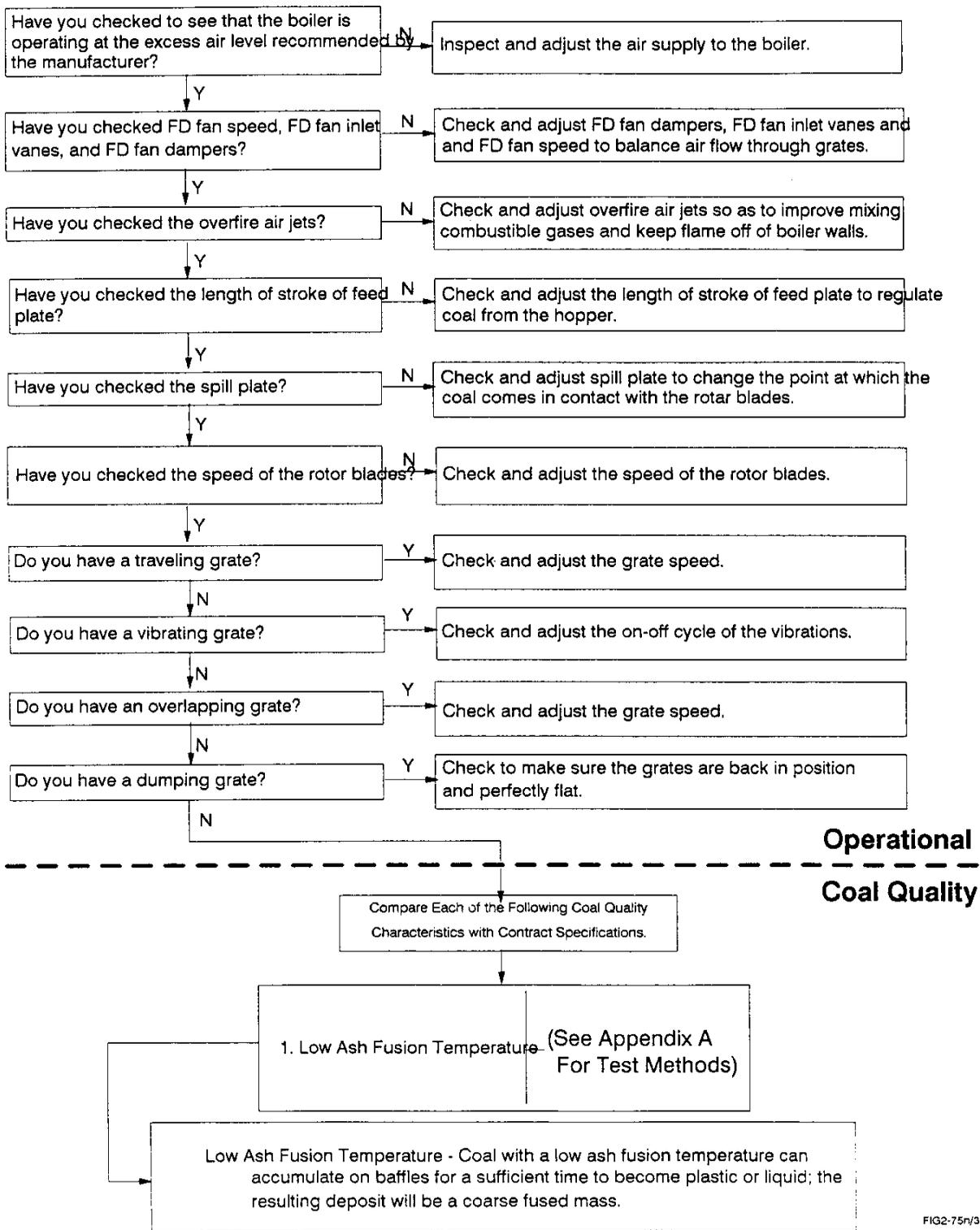
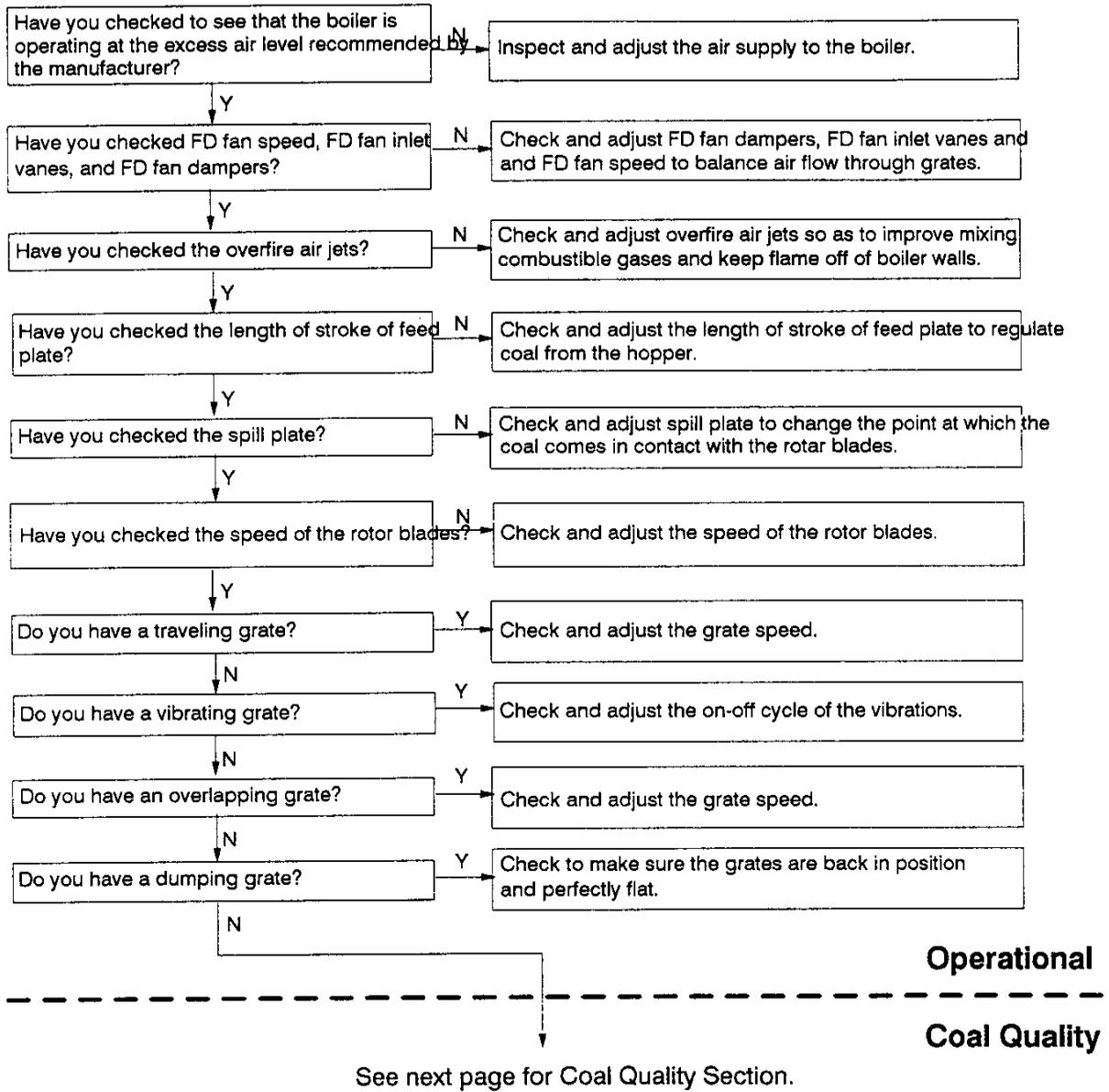
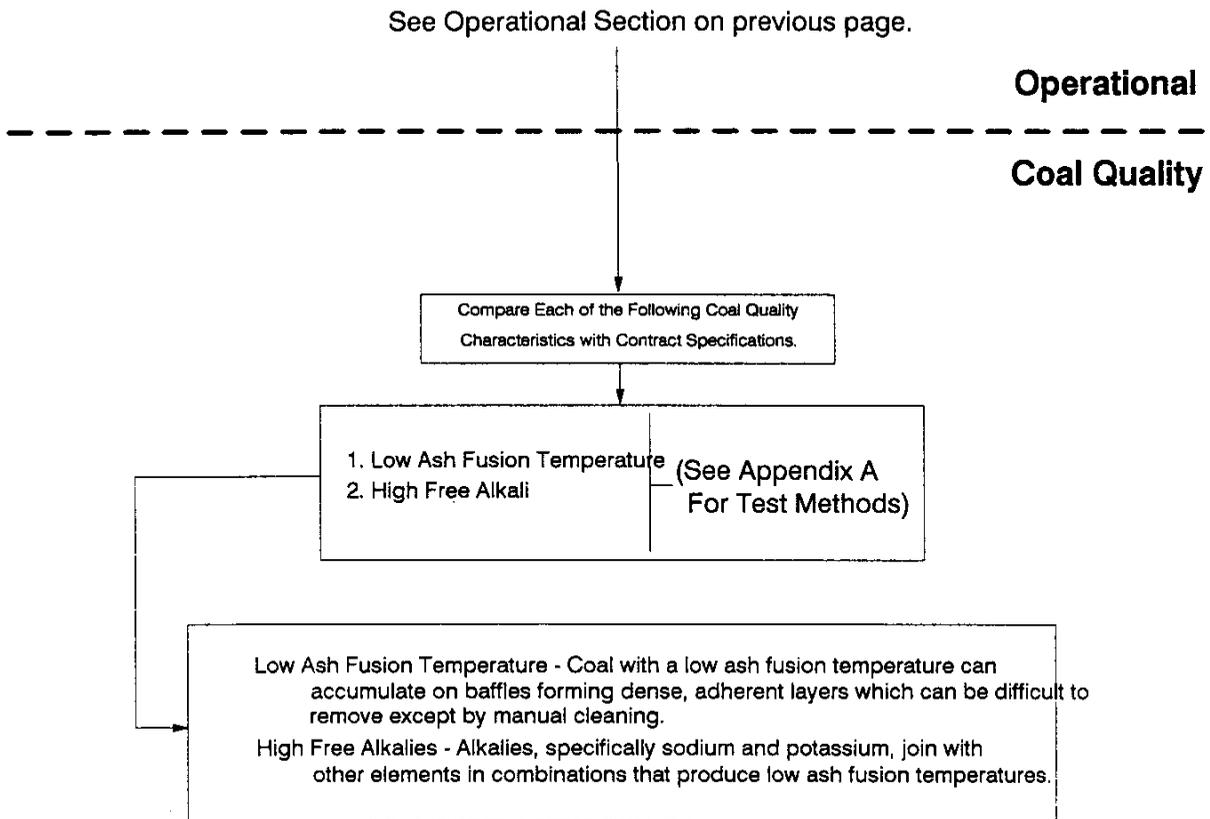


FIG2-75N/3

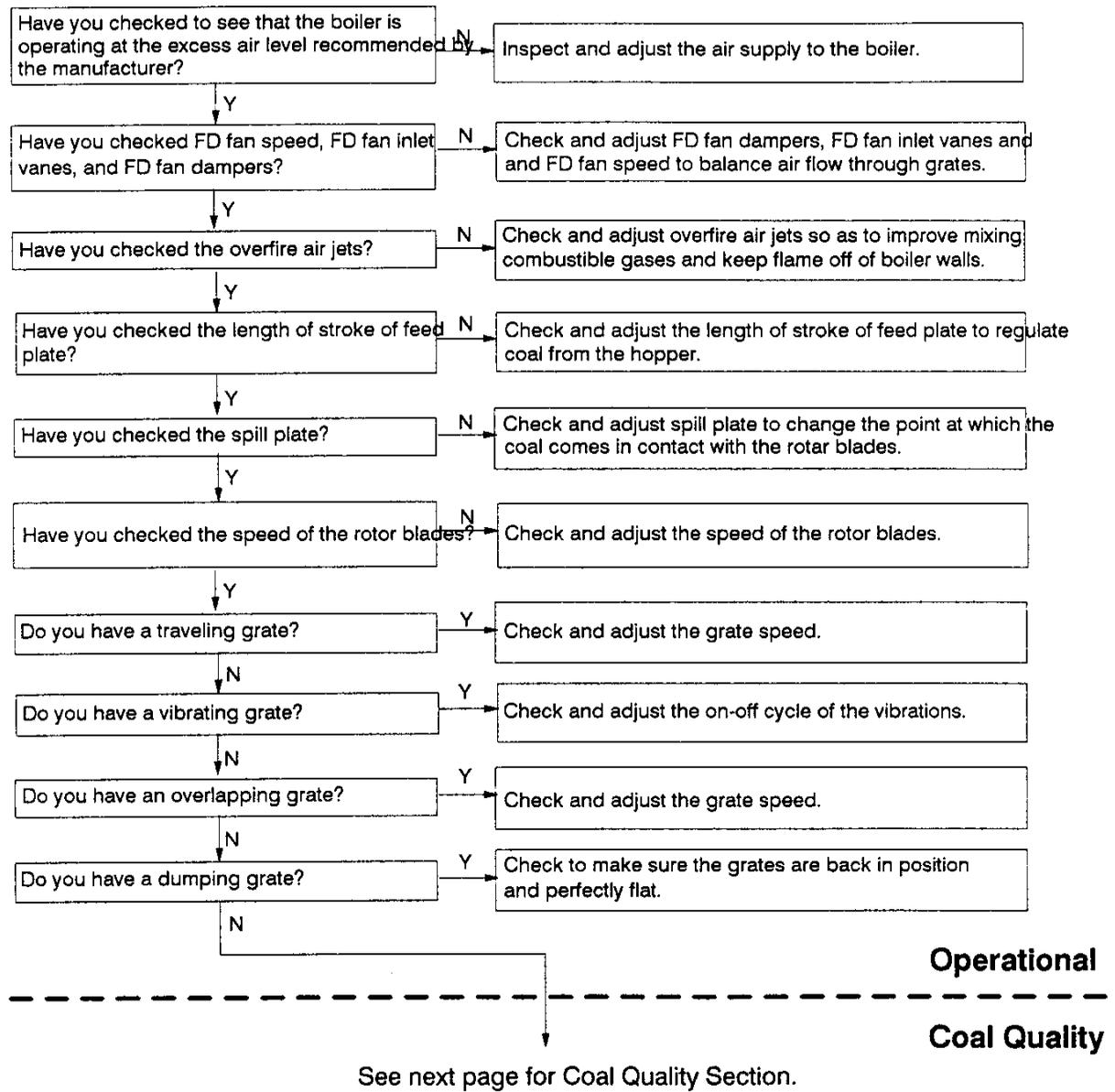
**FIGURE 2-76: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Fouling Of Heat Transfer Surfaces
(Baffles)**



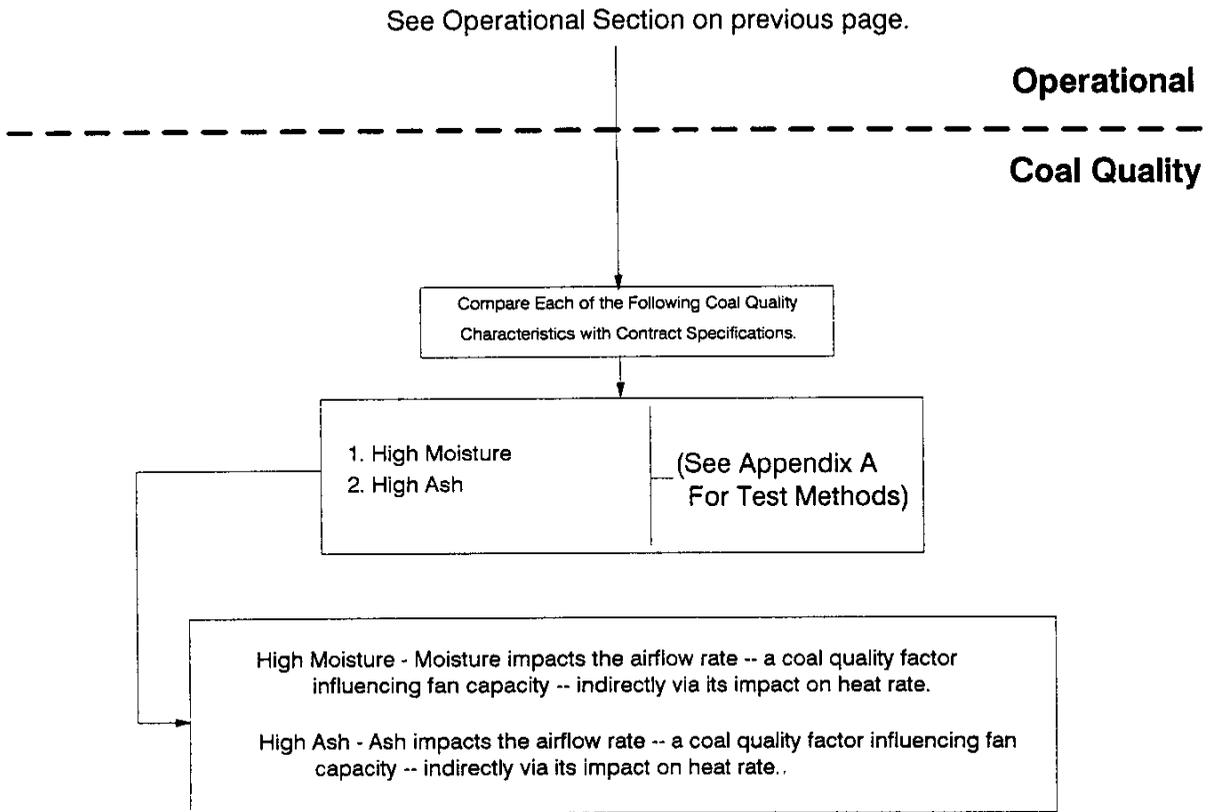
**FIGURE 2-76 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Fouling Of Heat Transfer Surfaces
(Baffles)**



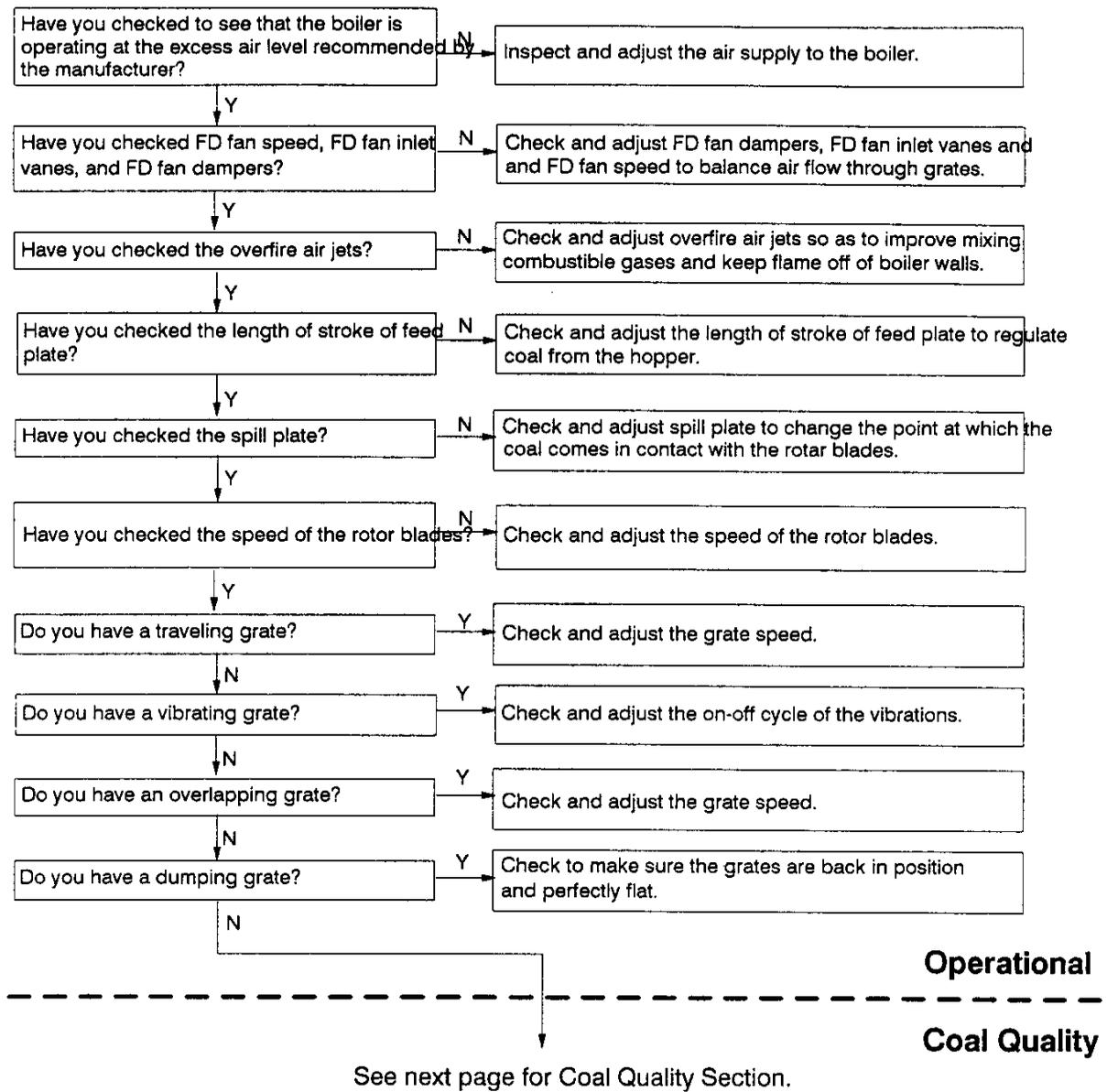
**FIGURE 2-77: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity and Inability To Meet Load
(Forced Draft Fan)**



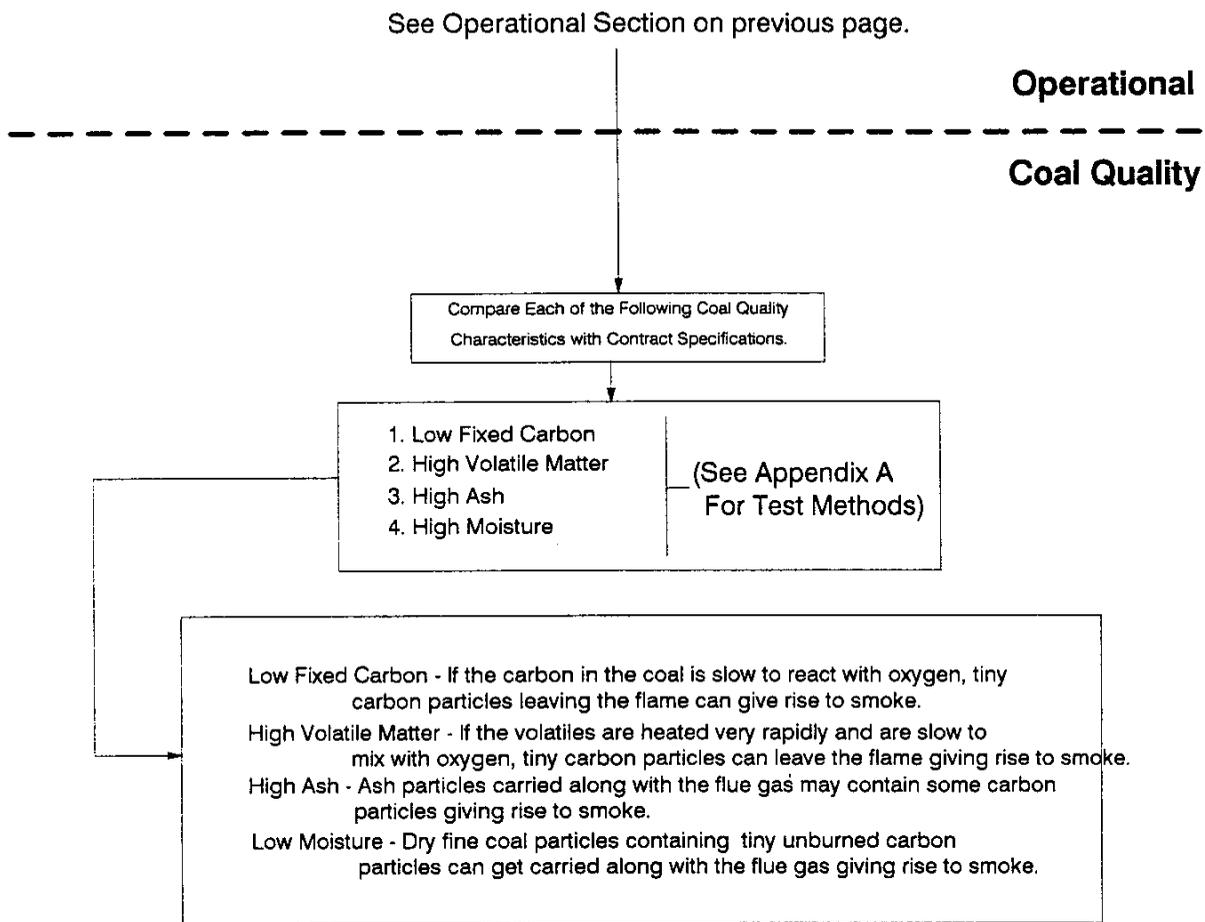
**FIGURE 2-77 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity and Inability To Meet Load
(Forced Draft Fan)**



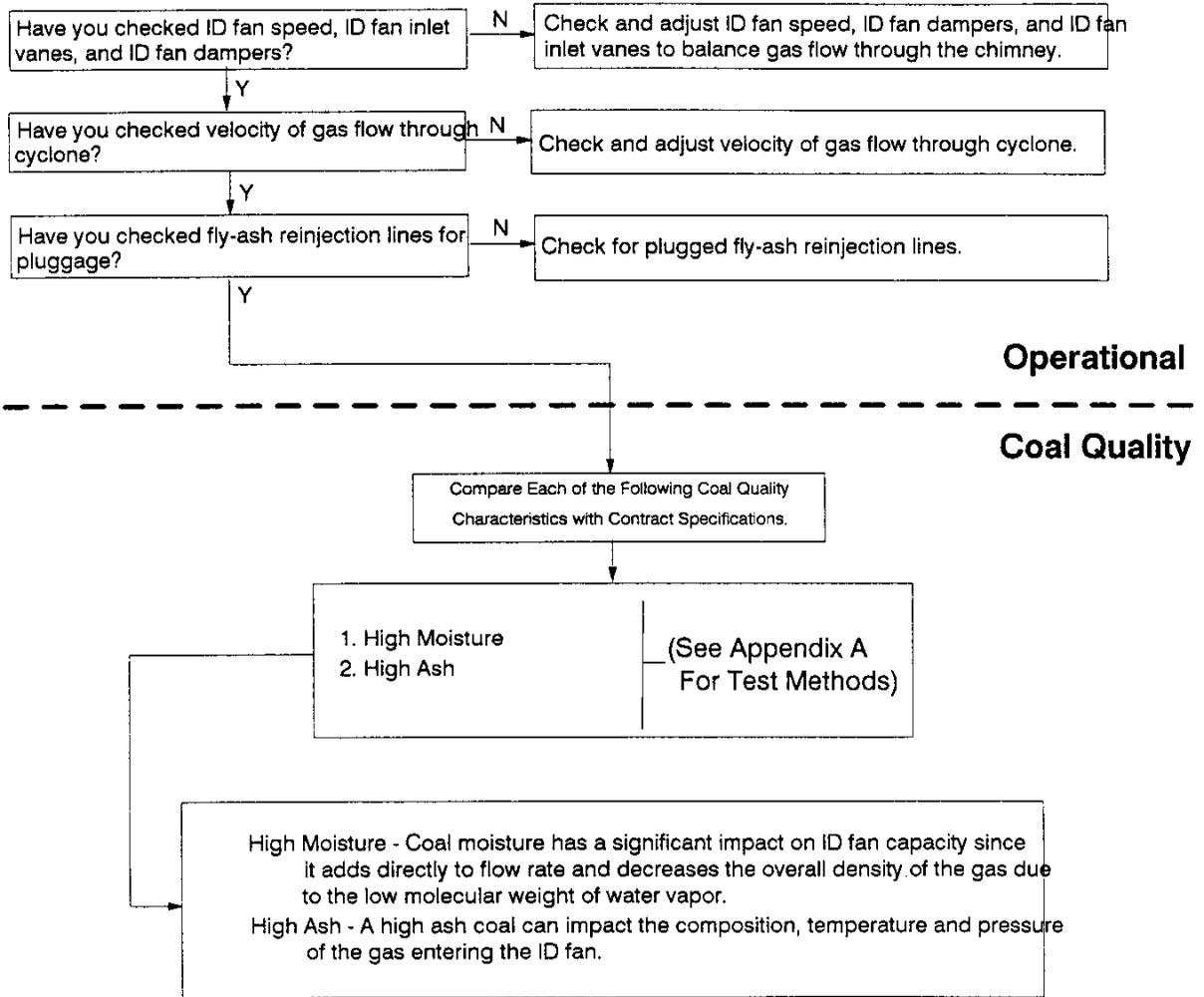
**FIGURE 2-78: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking Around The Forced Draft Fan**



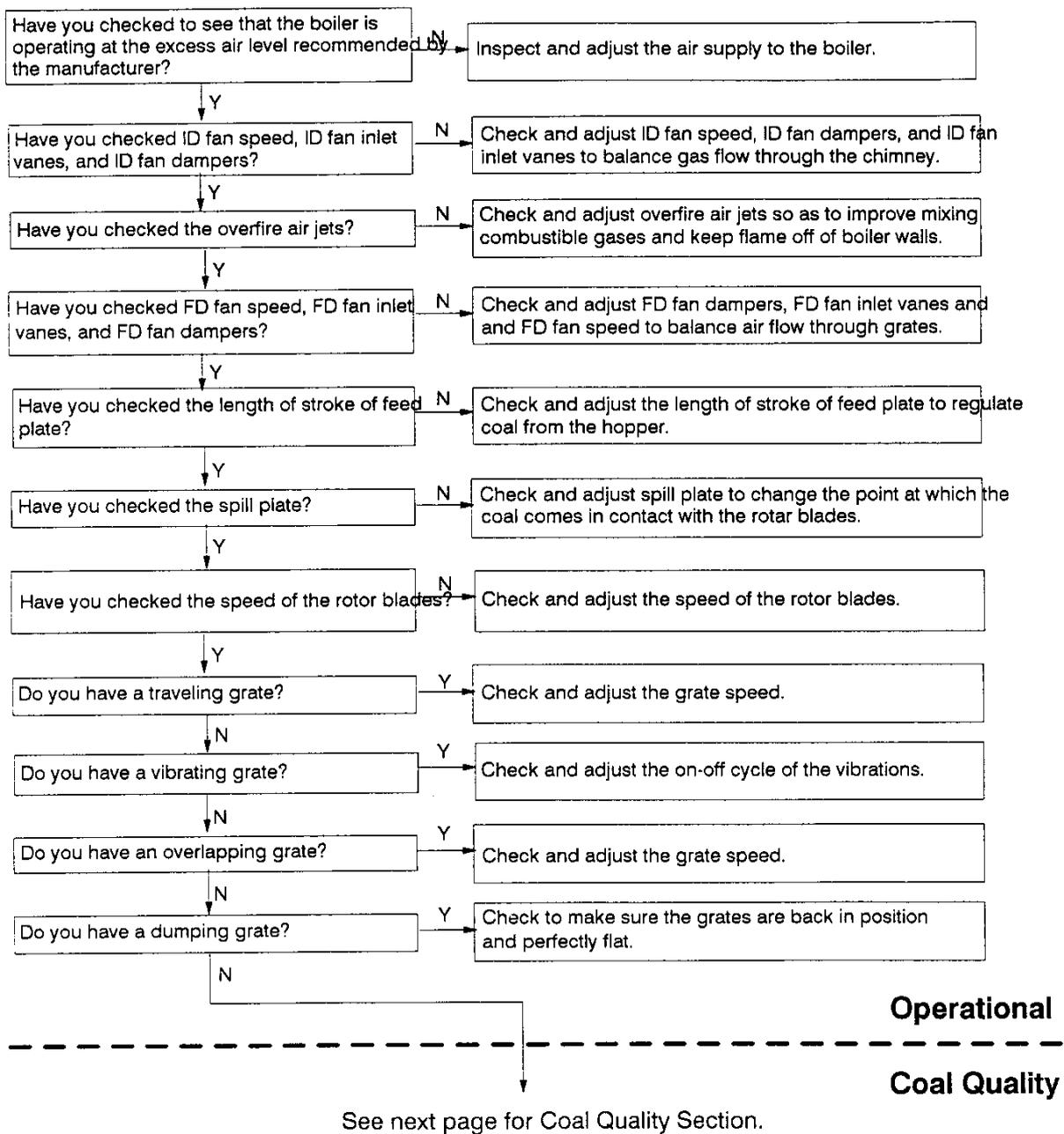
**FIGURE 2-78 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking Around The Forced Draft Fan**



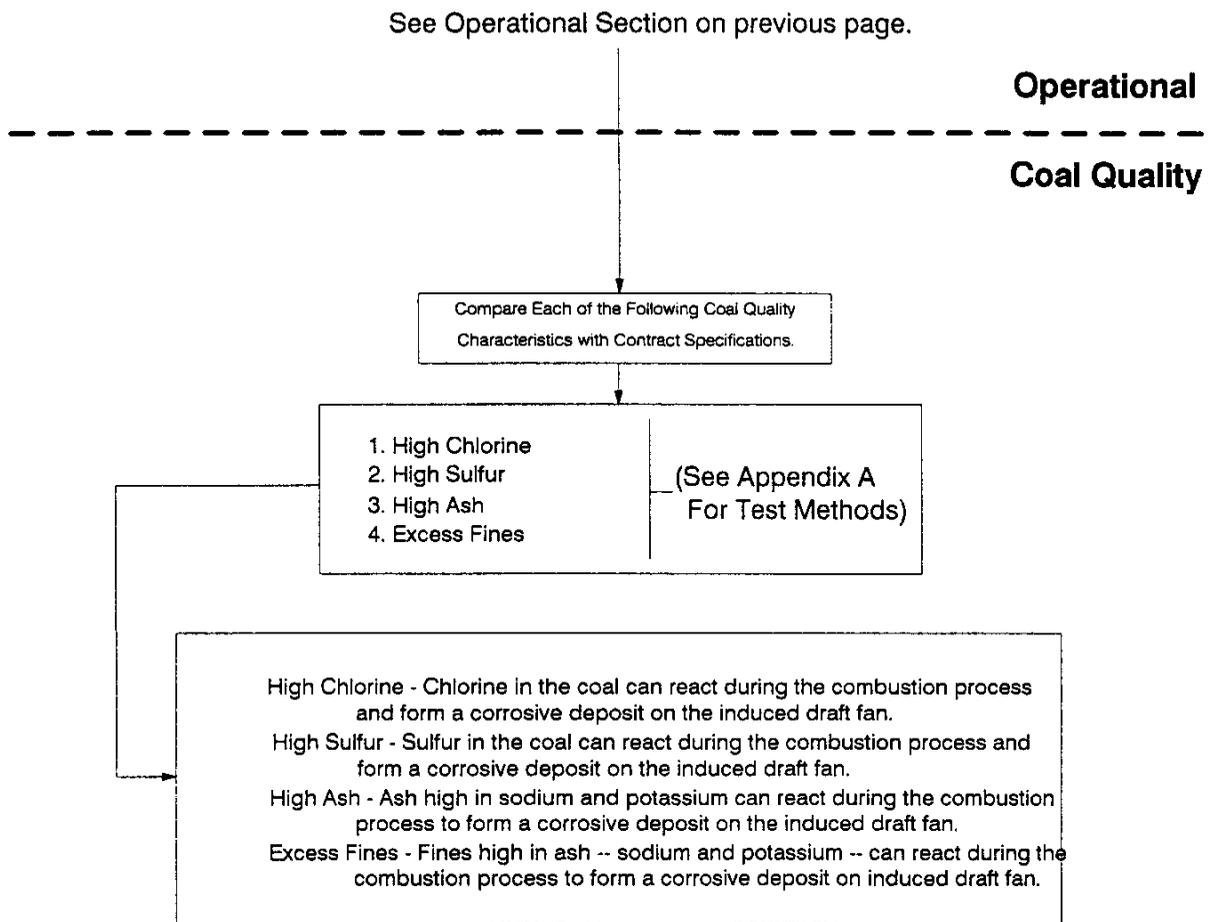
**FIGURE 2-79: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Insufficient Capacity And Inability To Meet Load
(Induced Draft Fan)**



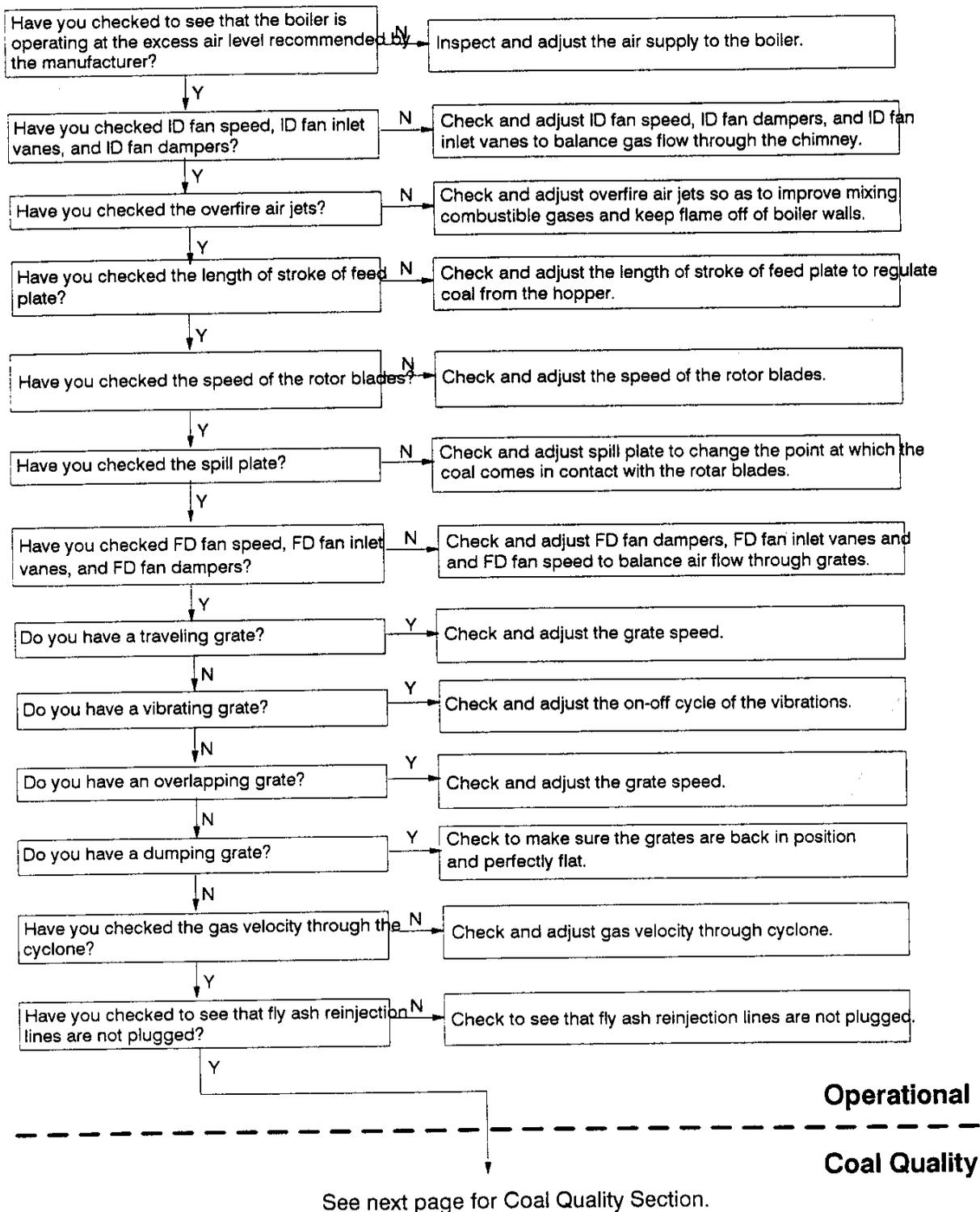
**FIGURE 2-80: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Induced Draft Fan**



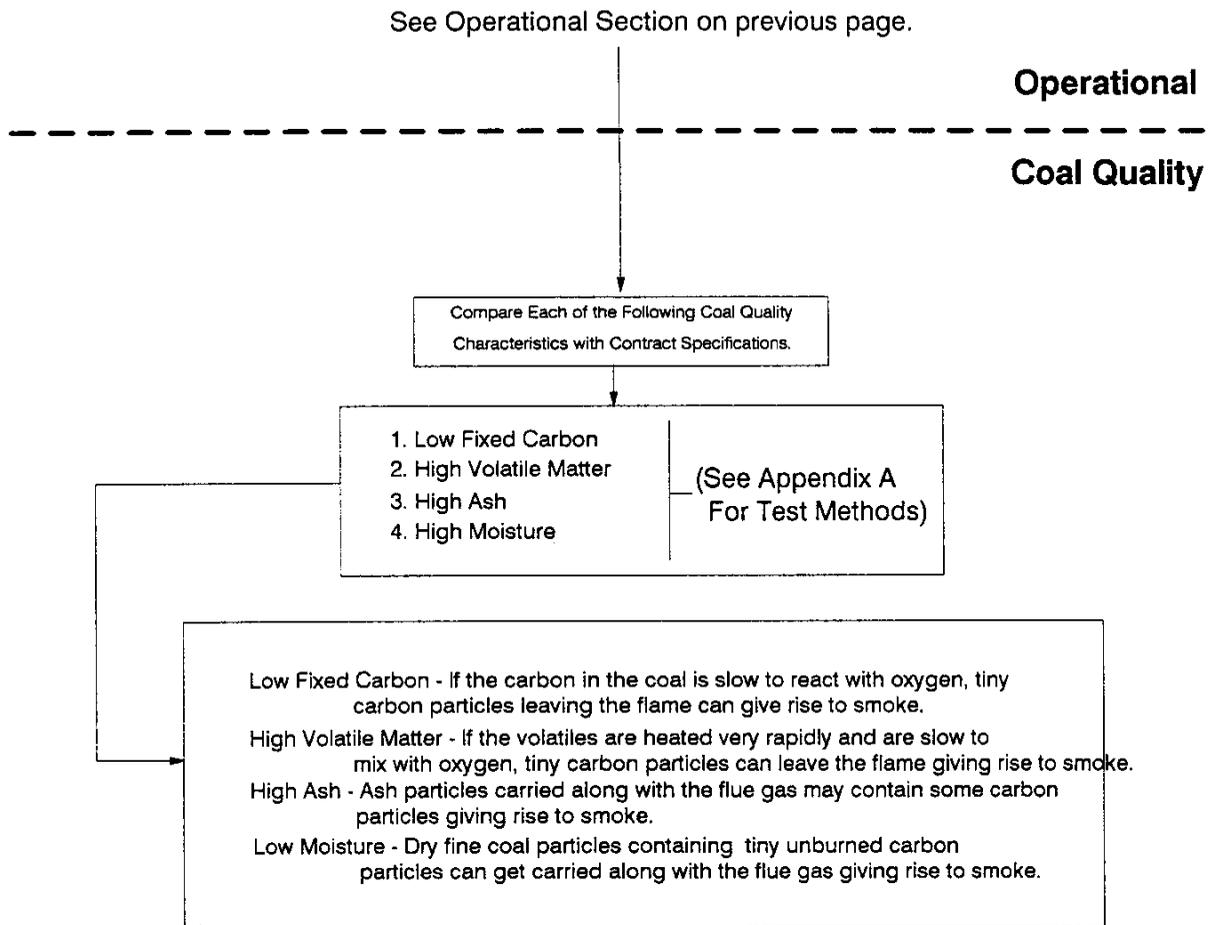
**FIGURE 2-80 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Induced Draft Fan**



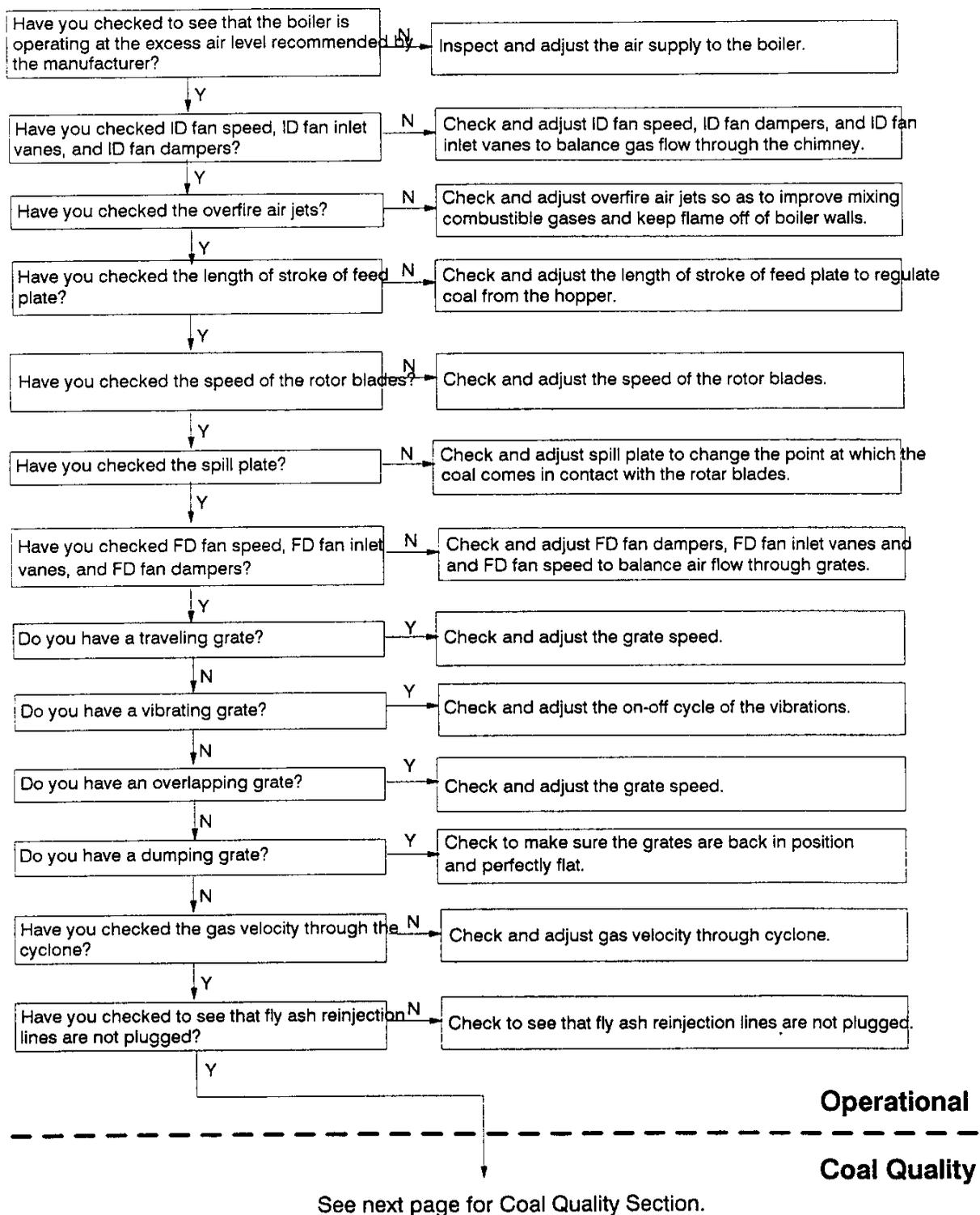
**FIGURE 2-81: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking From The Induced Draft Fan**



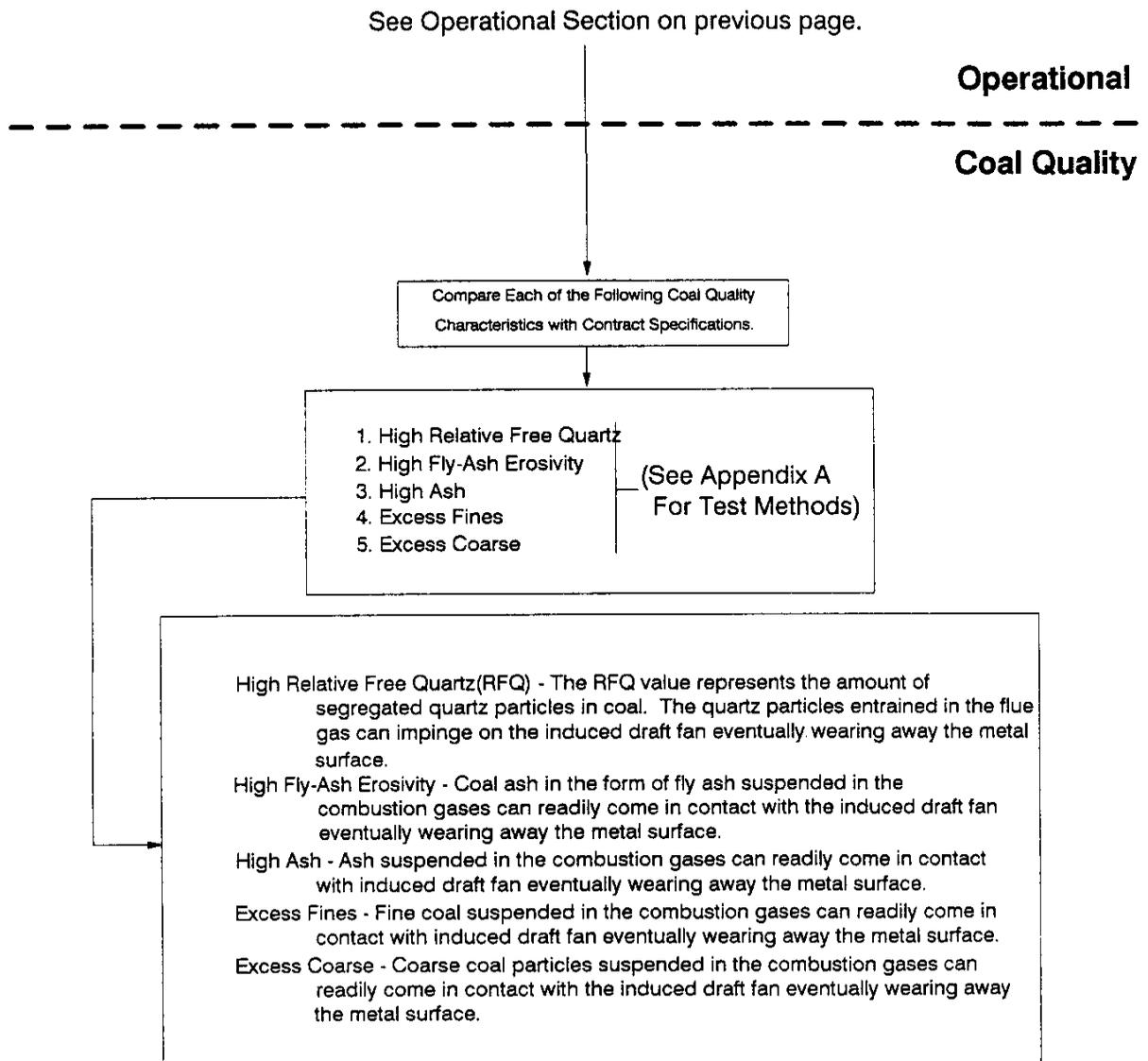
**FIGURE 2-81 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking From The Induced Draft Fan**



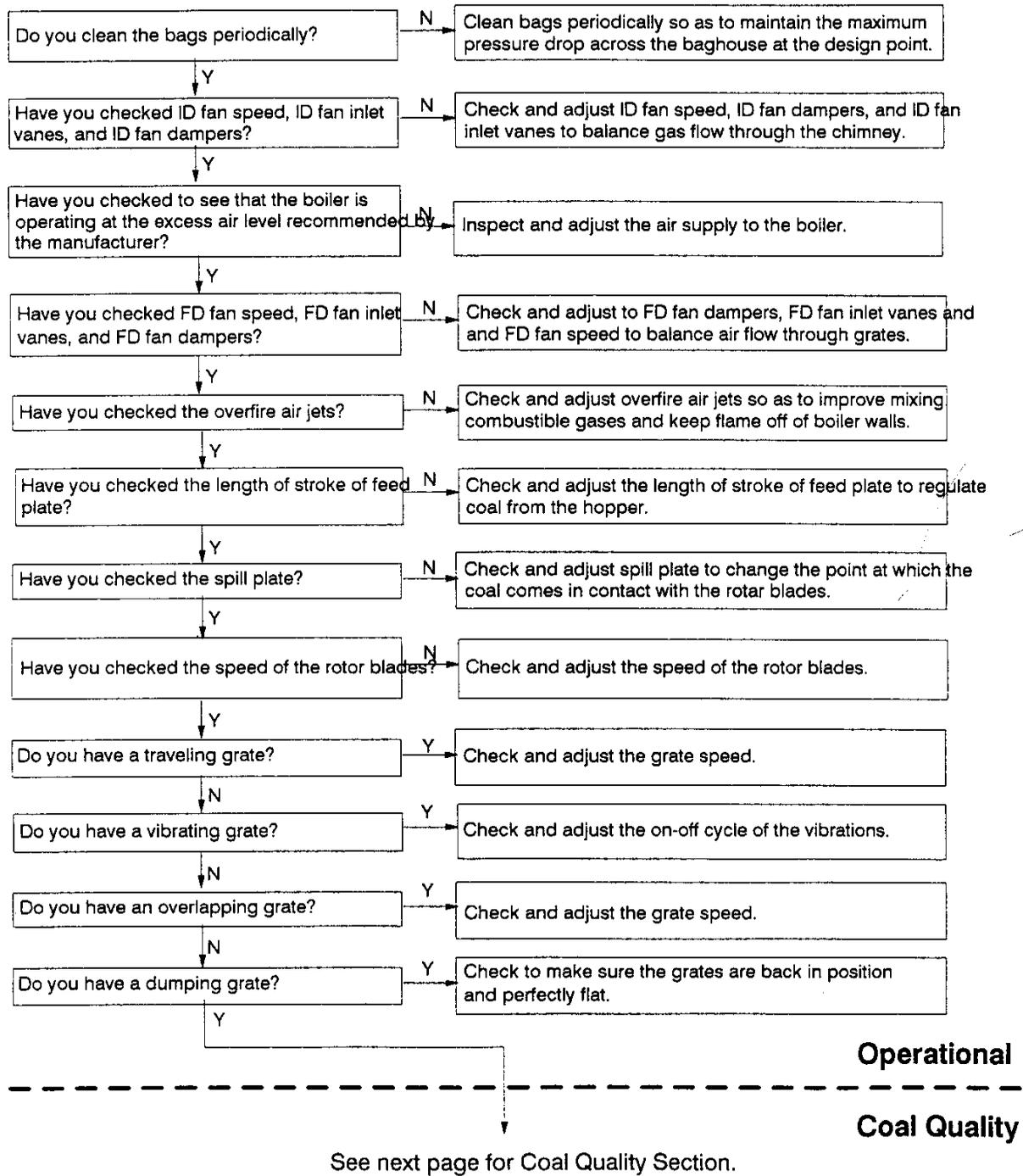
**FIGURE 2-82: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Induced Draft Fan**



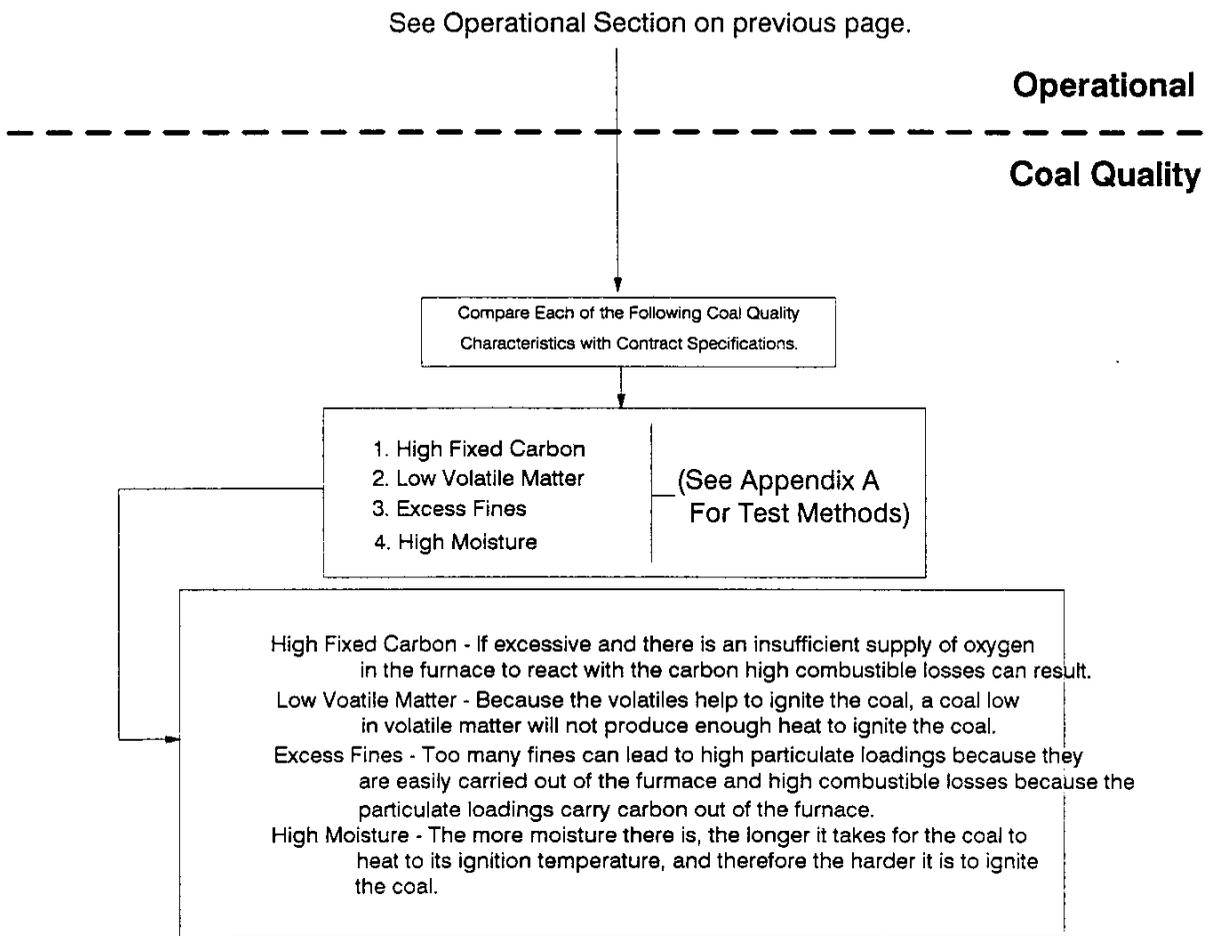
**FIGURE 2-82 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Induced Draft Fan**



**FIGURE 2-83: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Particulate Removal System
(Baghouse)**



**FIGURE 2-83 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Particulate Removal System
(Baghouse)**



**FIGURE 2-84: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Particulate Removal System
(Baghouse)**

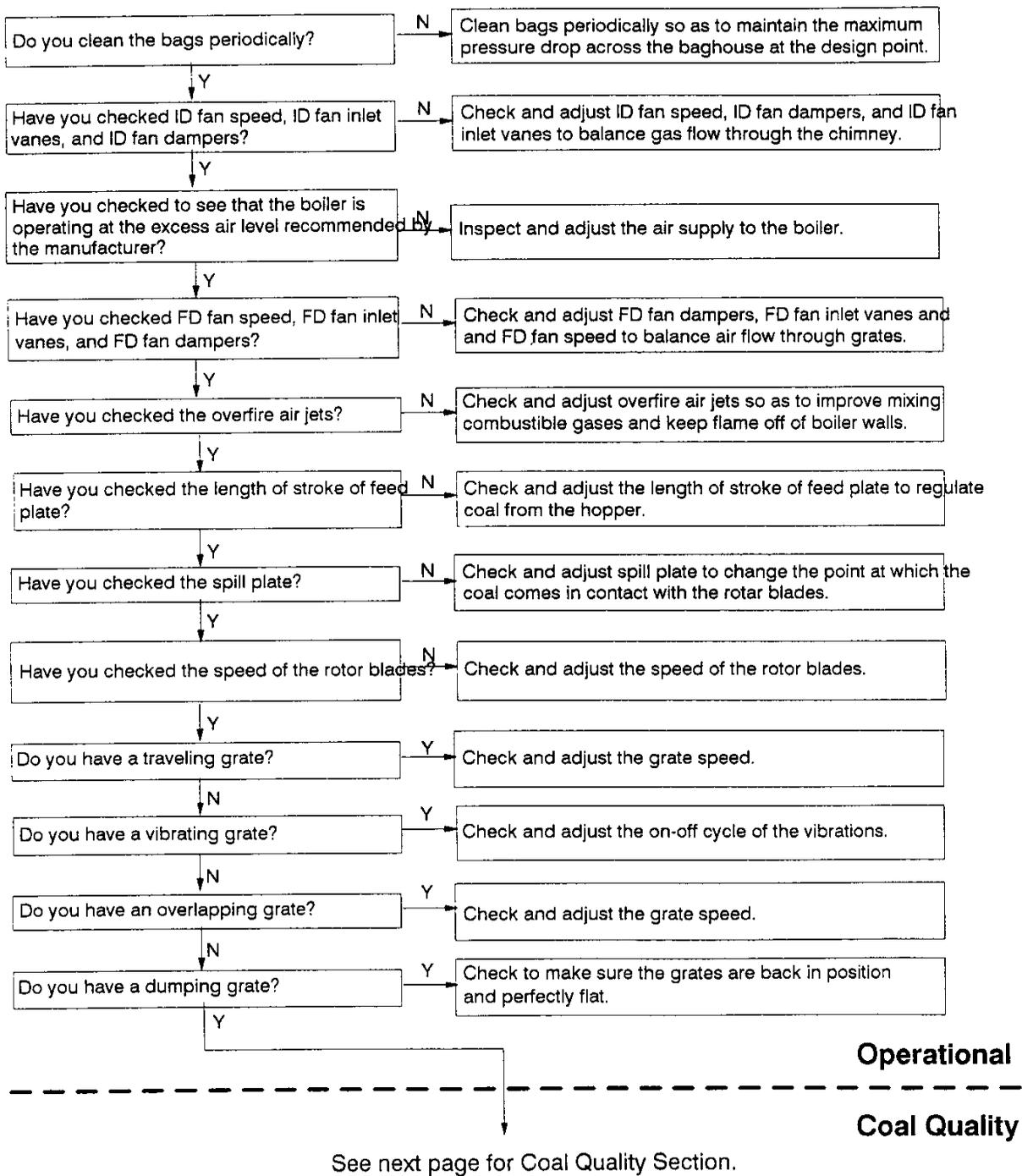
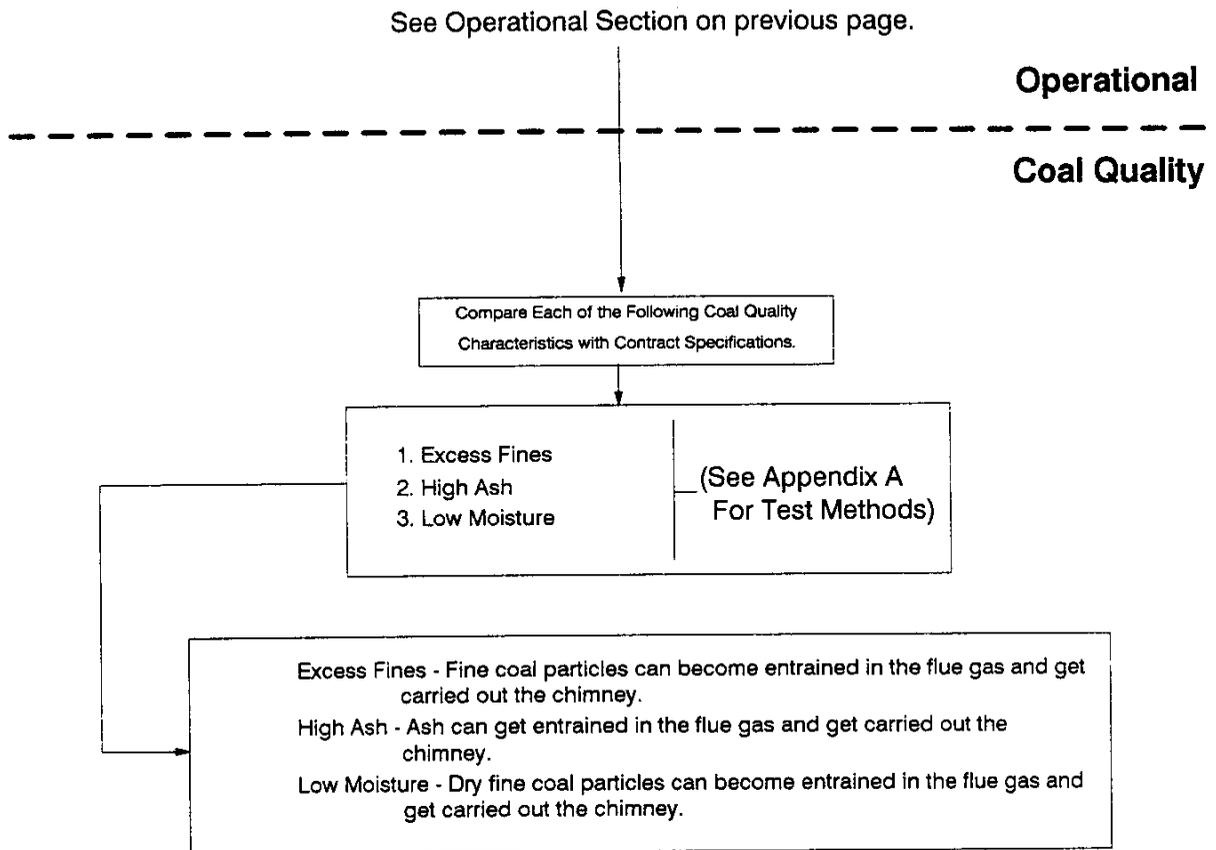
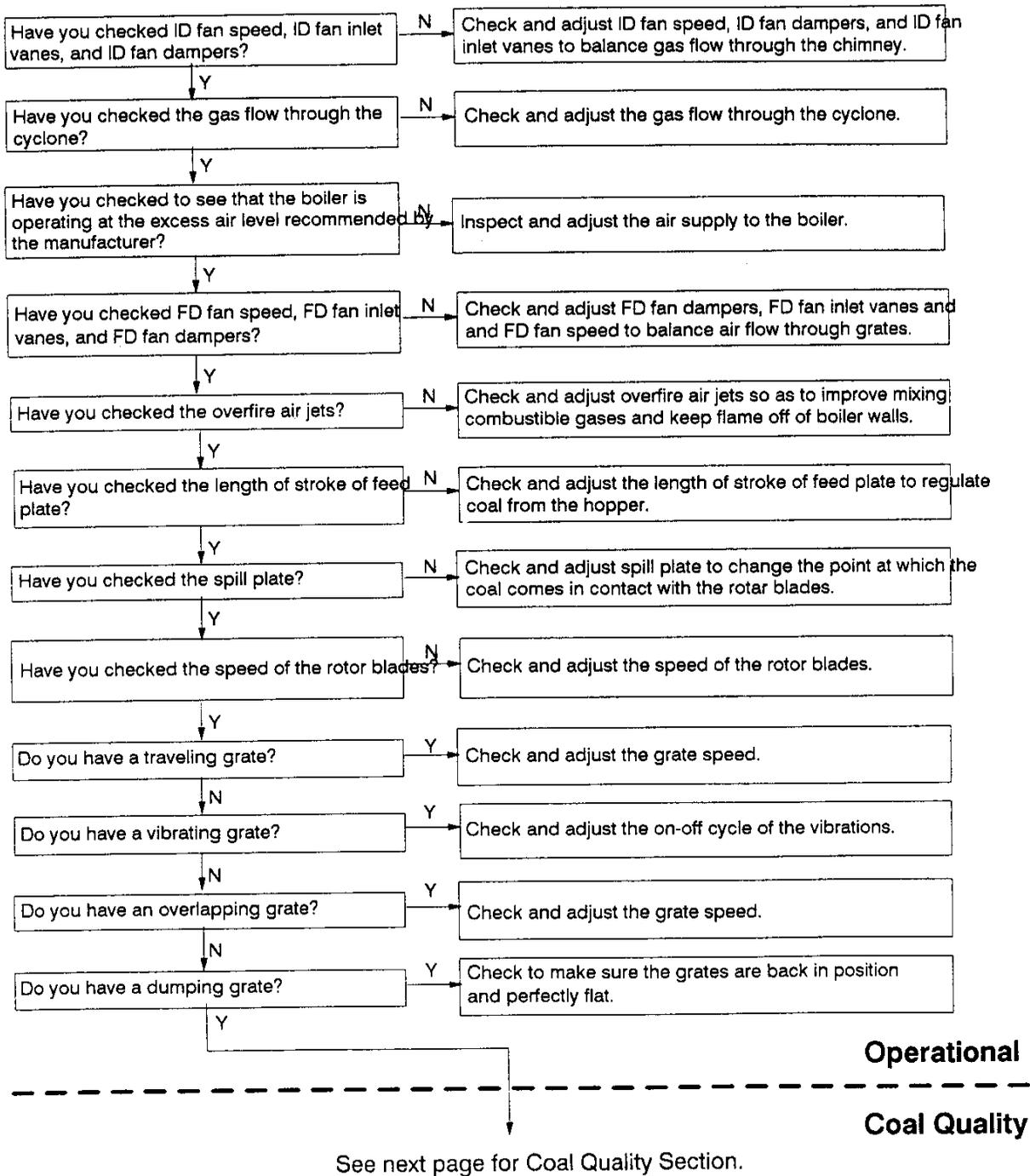


FIG2-84n/3

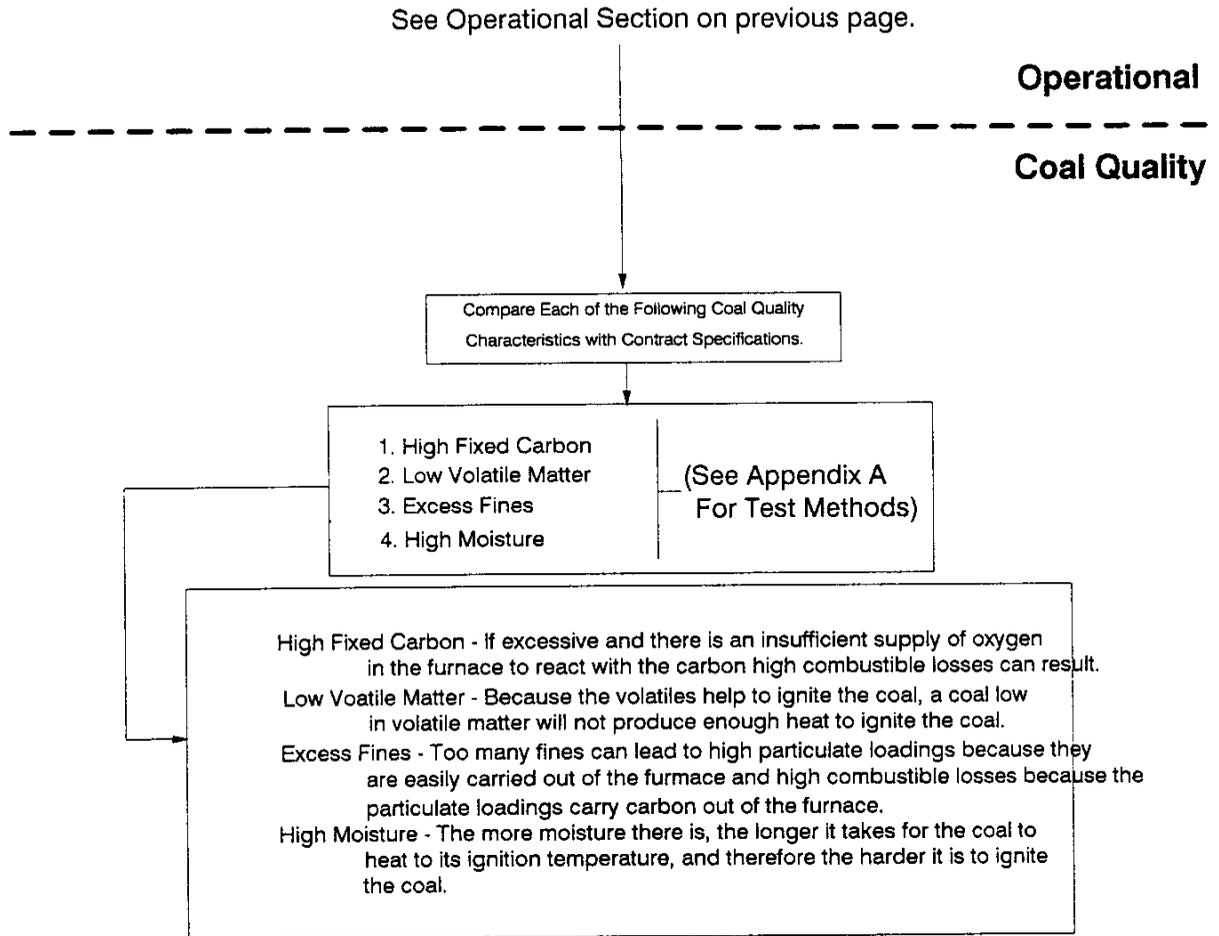
**FIGURE 2-84 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Particulate Removal System
(Baghouse)**



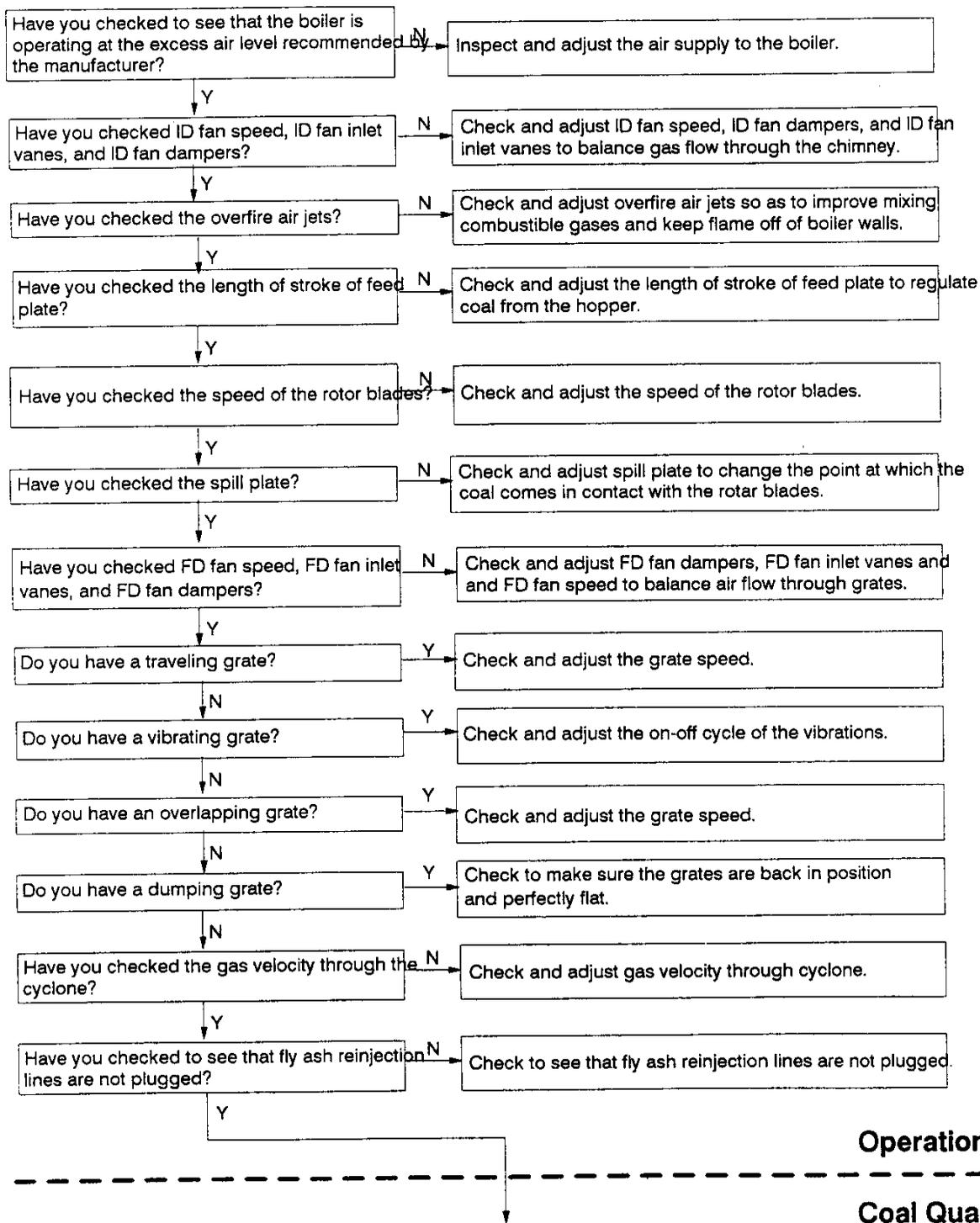
**FIGURE 2-85: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Particulate Removal System
(Cyclone Dust Collector)**



**FIGURE 2-85 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Particulate Removal System
(Cyclone Dust Collector)**

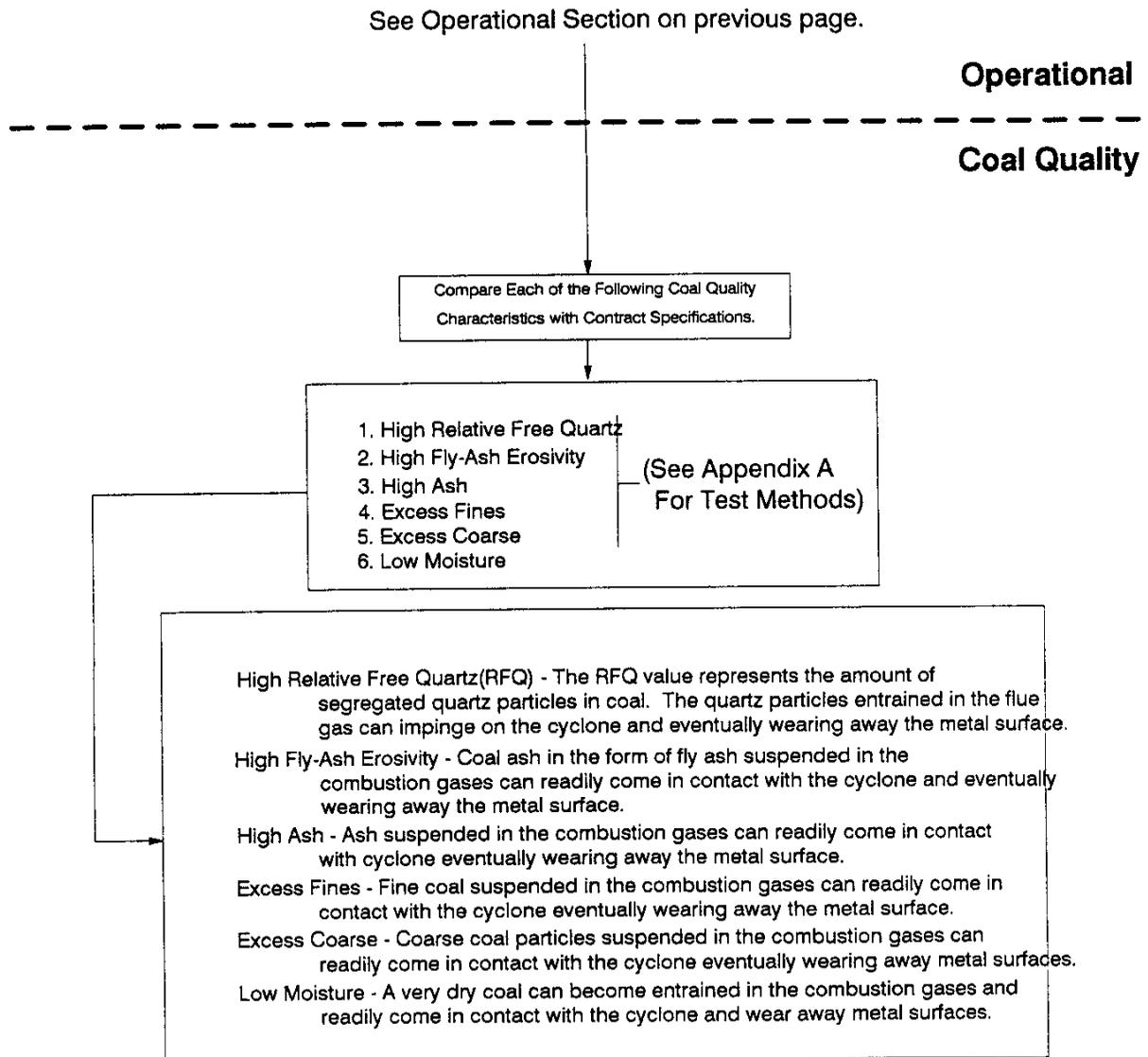


**FIGURE 2-86: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion In The Particulate Removal System
(Cyclone)**



See next page for Coal Quality Section.

**FIGURE 2-86 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion In The Particulate Removal System
(Cyclone)**



**FIGURE 2-87: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Particulate Removal System
(Cyclone)**

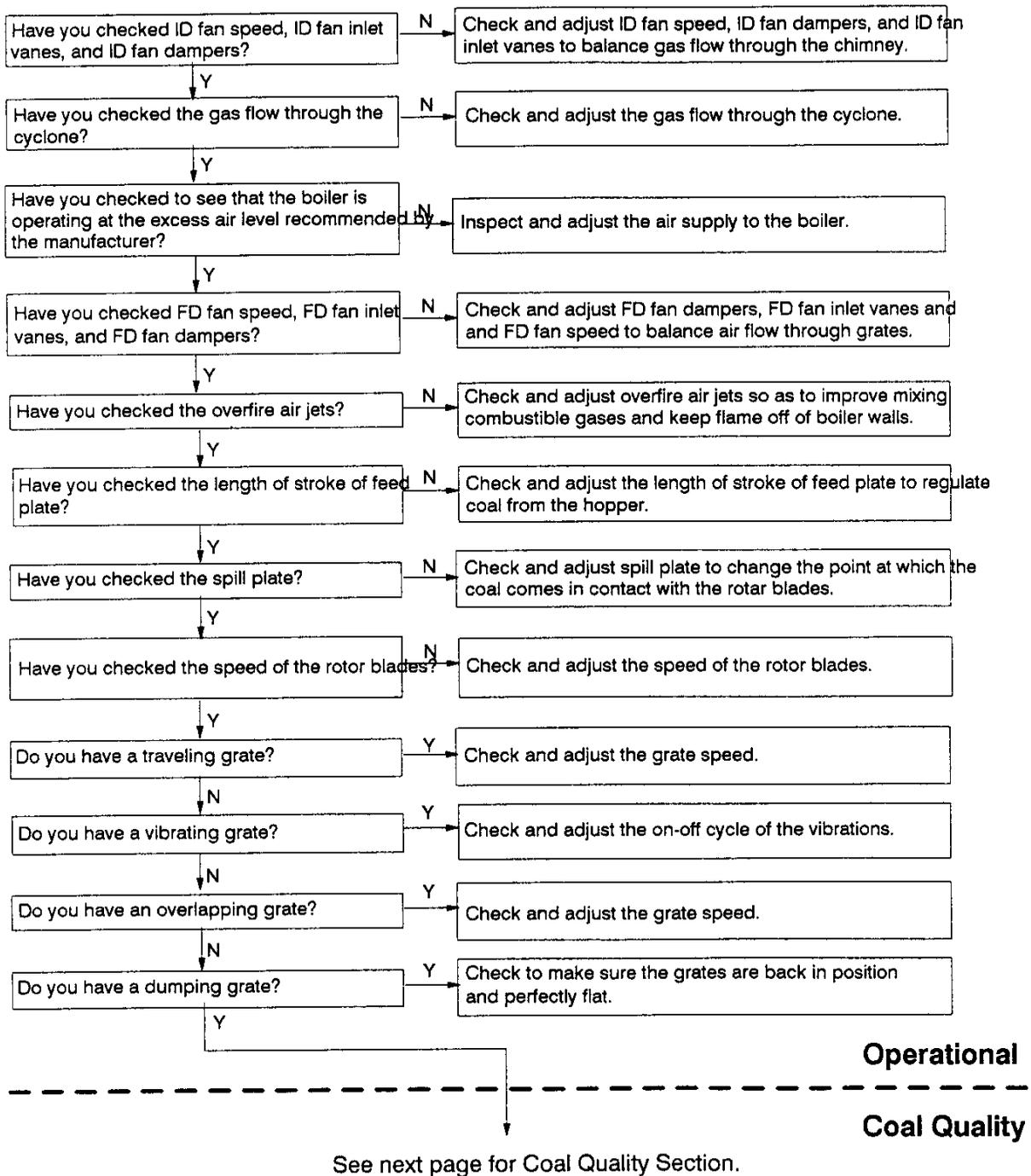
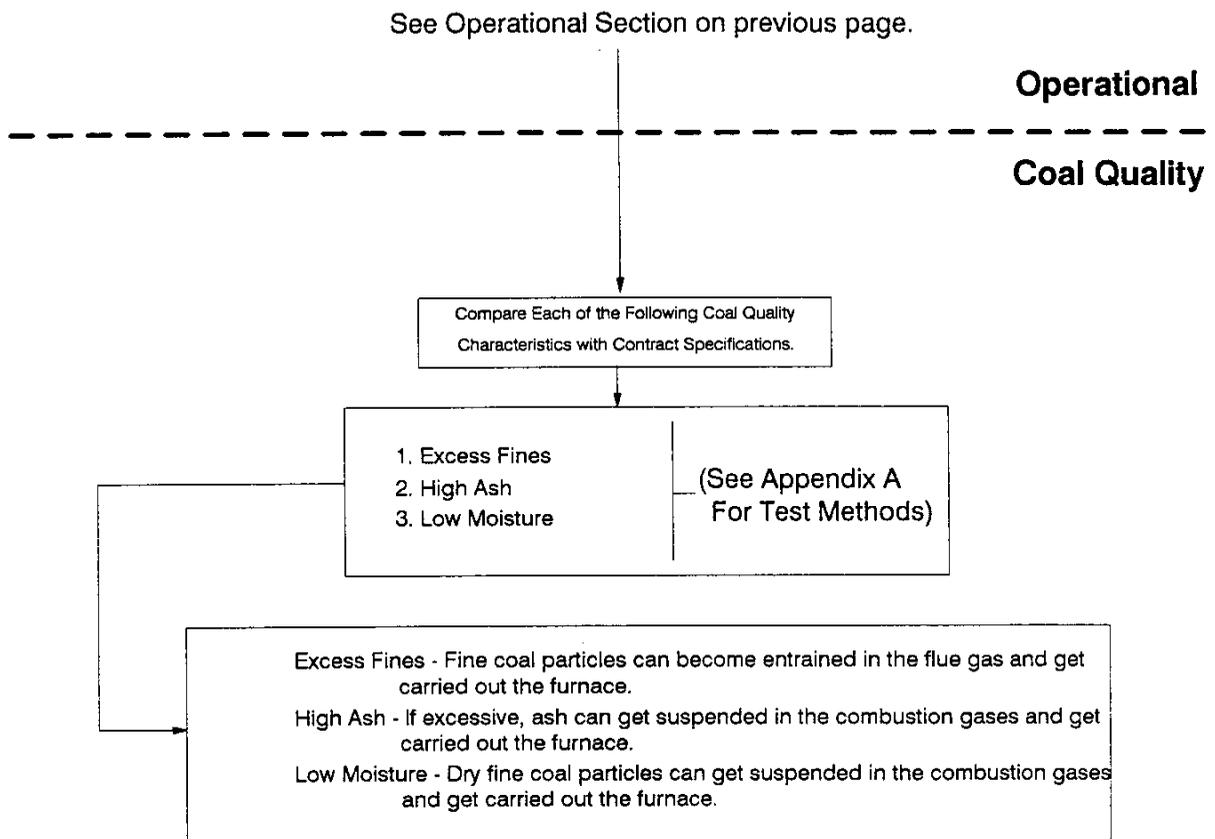
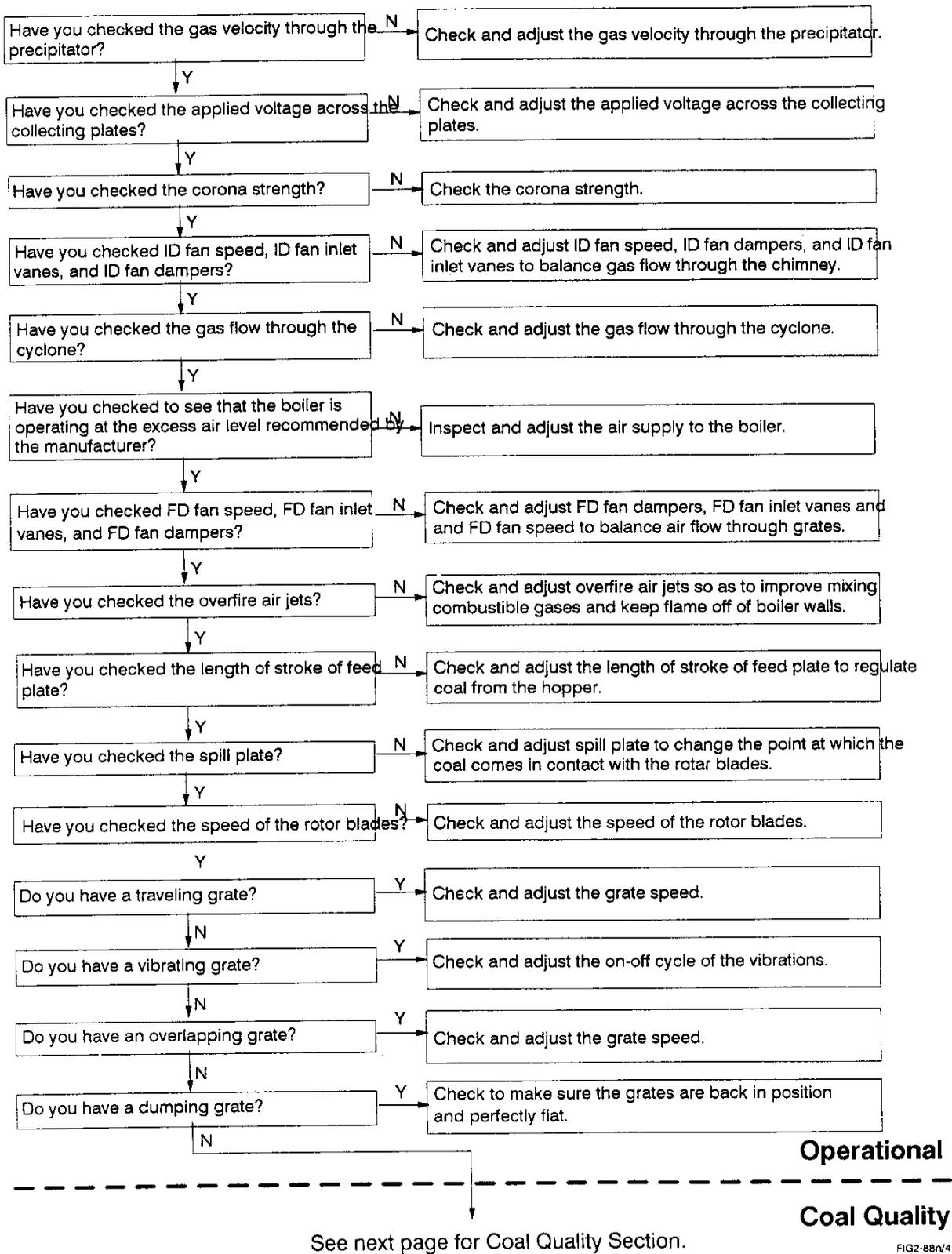


FIG2-87rv3

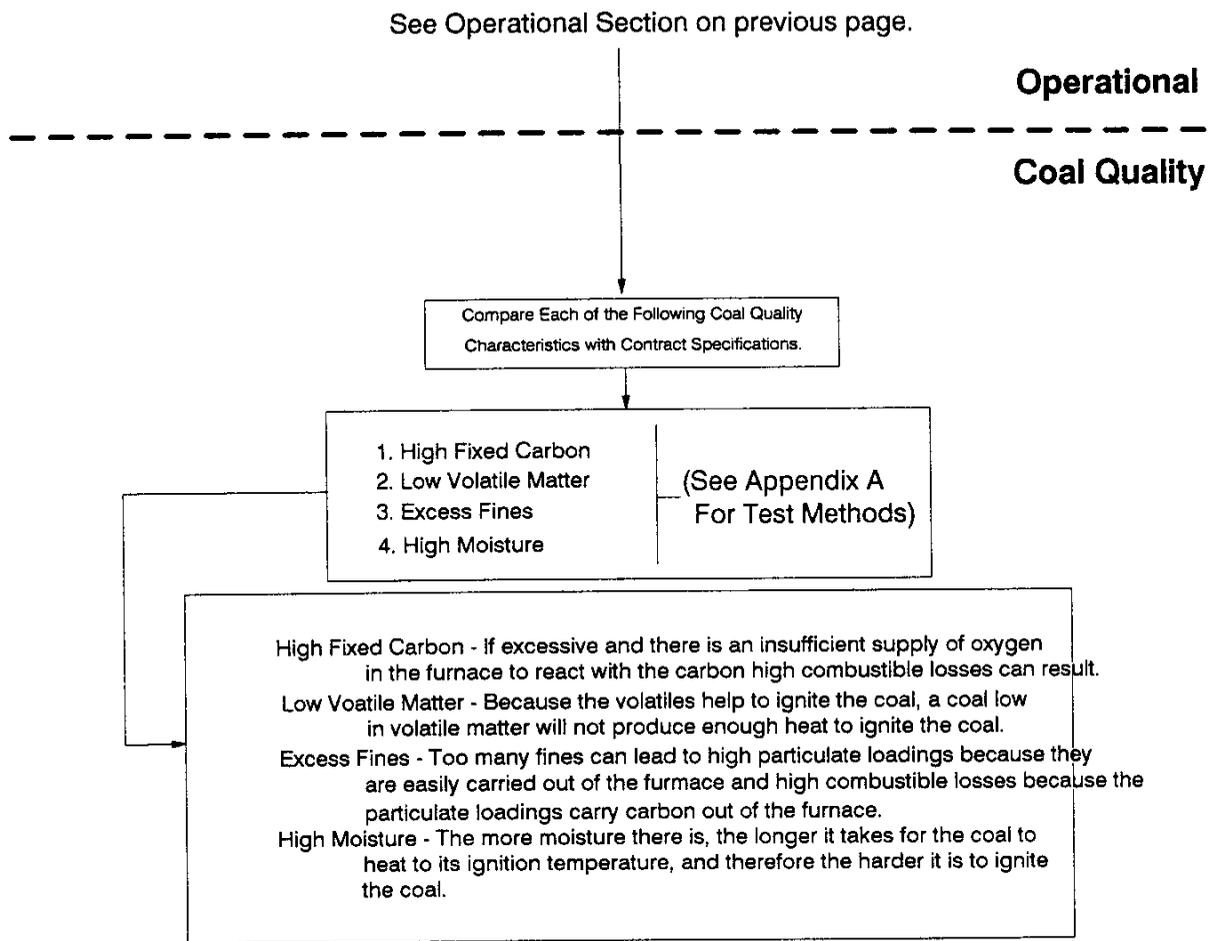
**FIGURE 2-87 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Particulate Removal System
(Cyclone)**



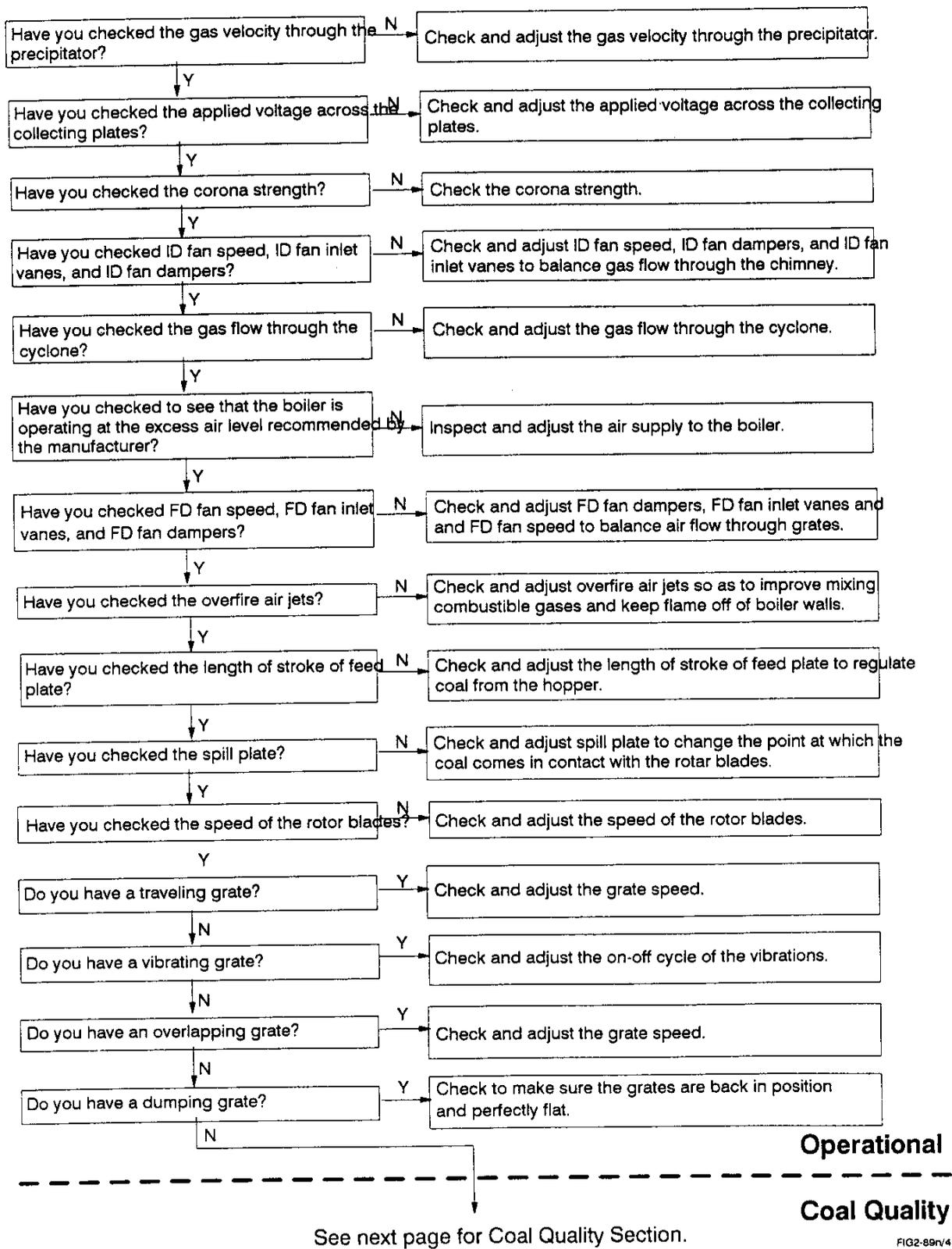
**FIGURE 2-88: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout In The Particulate Removal System
(Electrostatic Precipitator)**



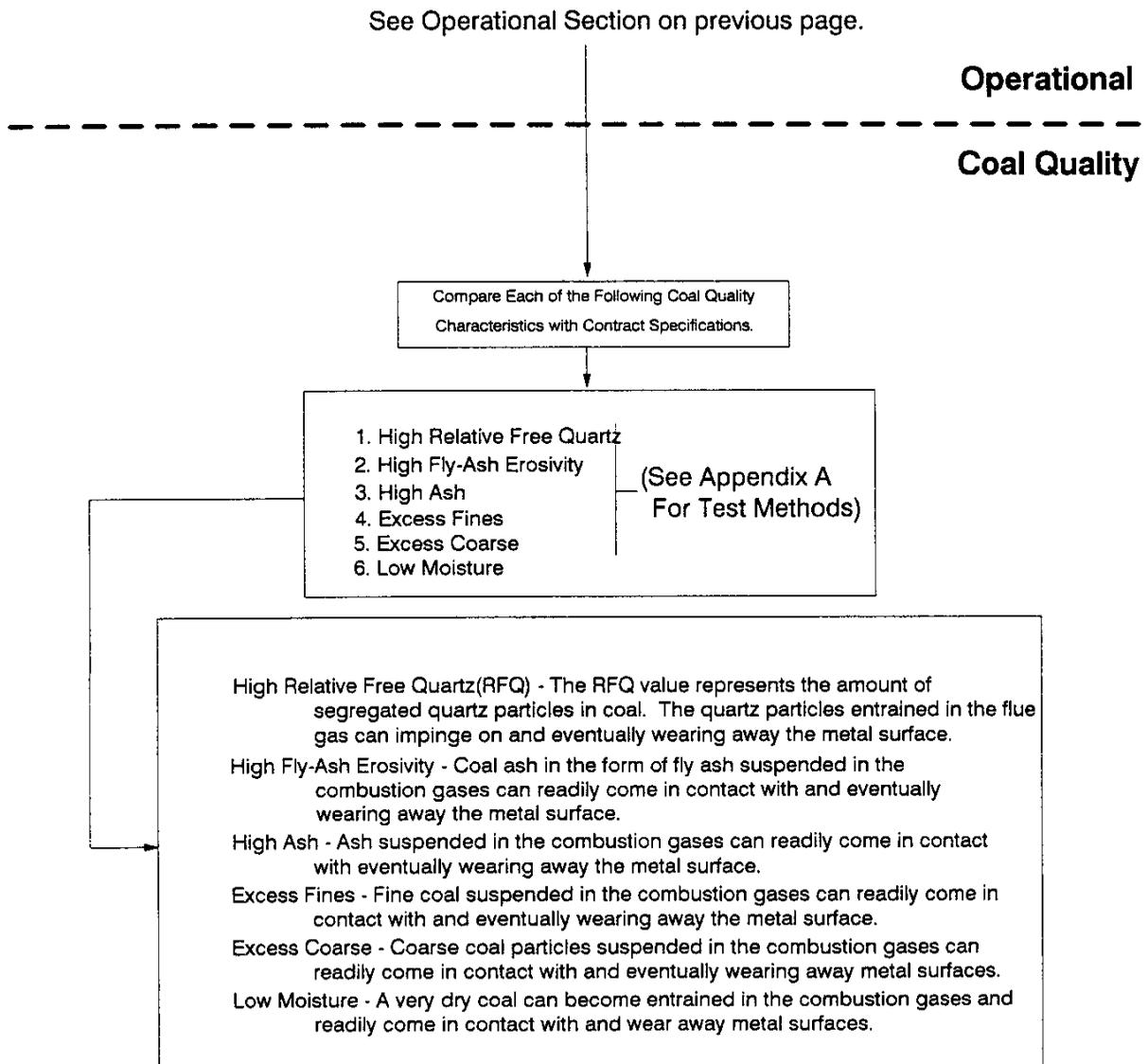
**FIGURE 2-88 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout In The Particulate Removal System
(Electrostatic Precipitator)**



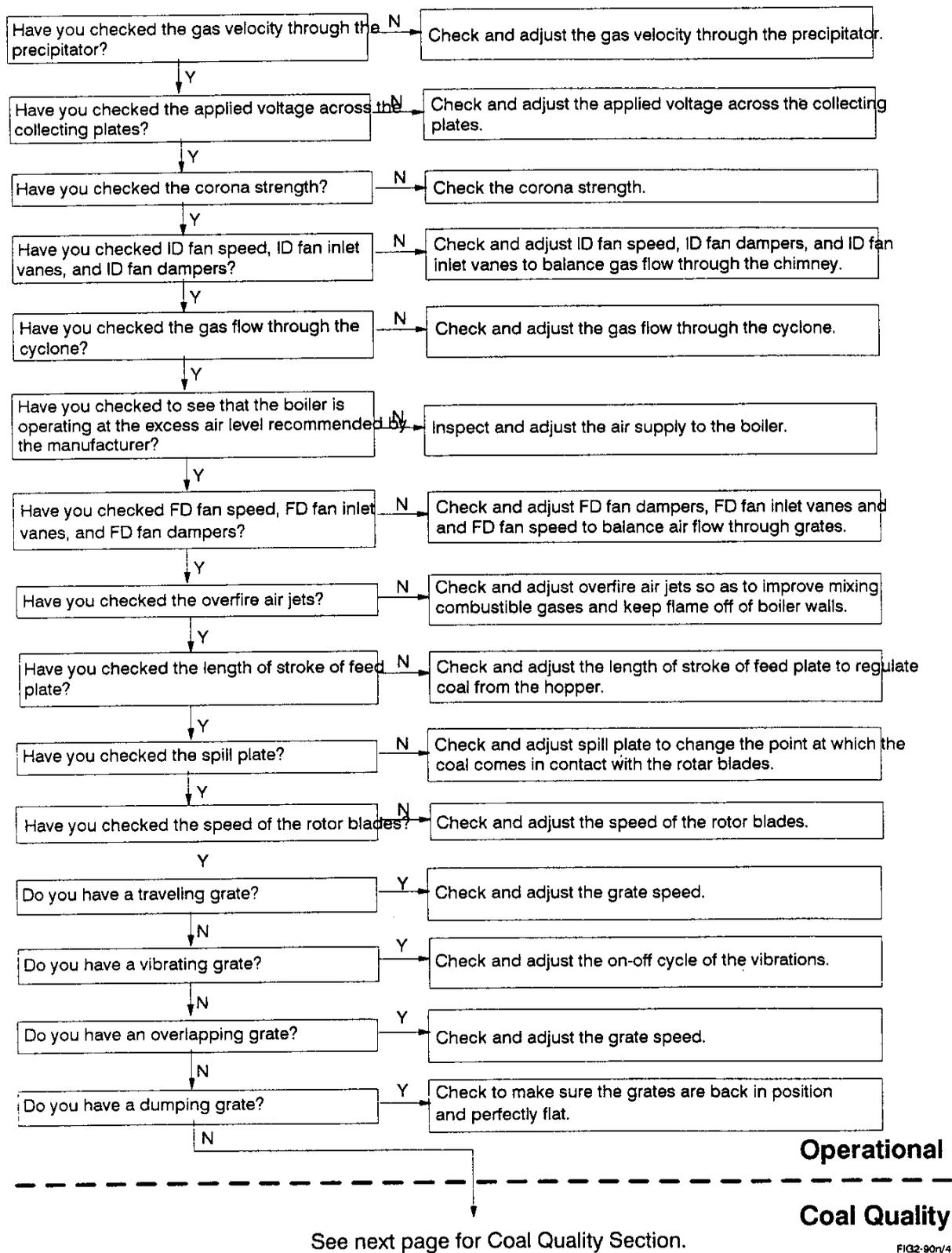
**FIGURE 2-89: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Particulate Removal System
(Electrostatic Precipitator)**



**FIGURE 2-89 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Erosion Of The Particulate Removal System
(Electrostatic Precipitator)**



**FIGURE 2-90: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions Of The Particulate Removal System
(Electrostatic Precipitator)**



**FIGURE 2-90 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions Of The Particulate Removal System
(Electrostatic Precipitator)**

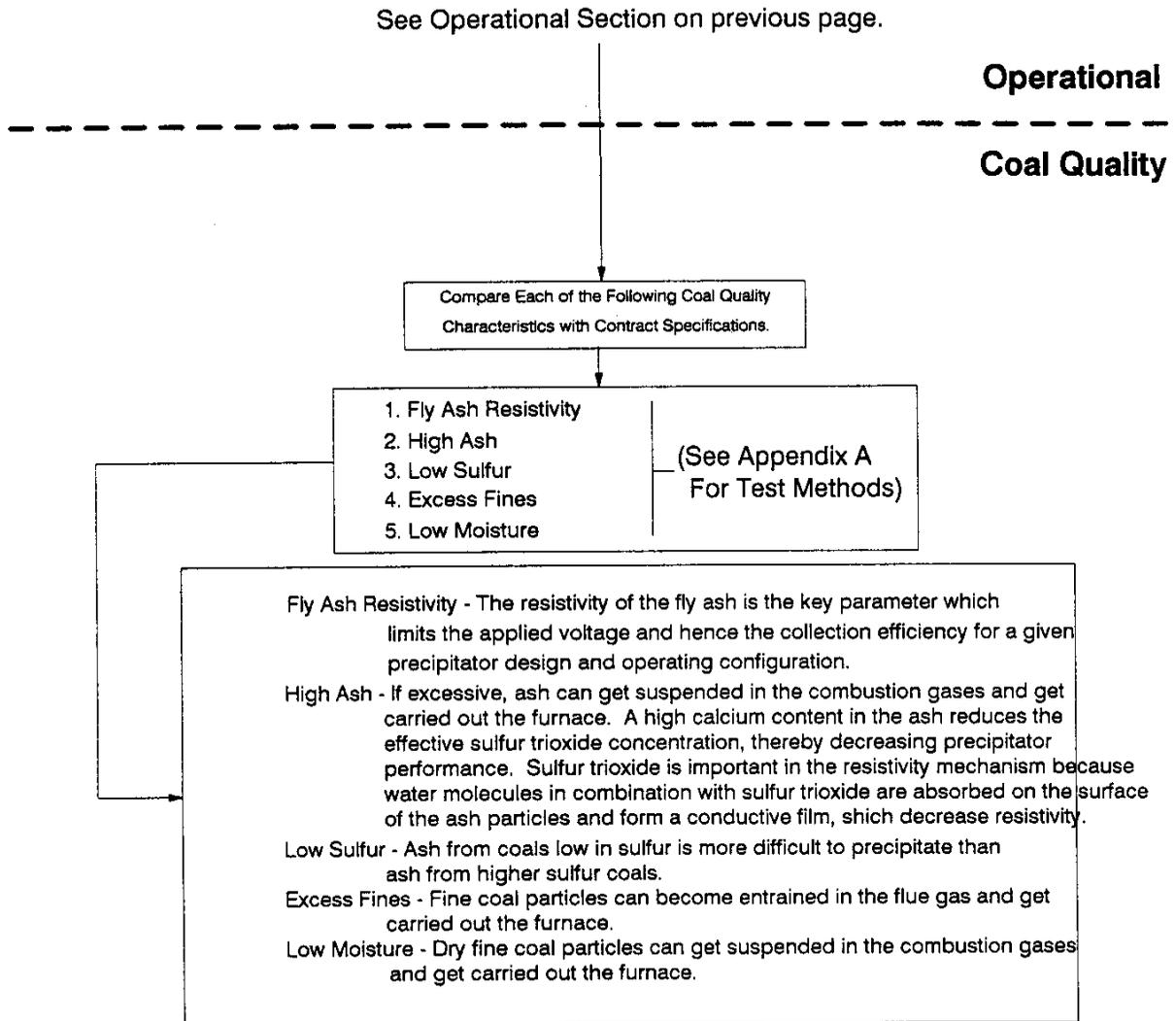
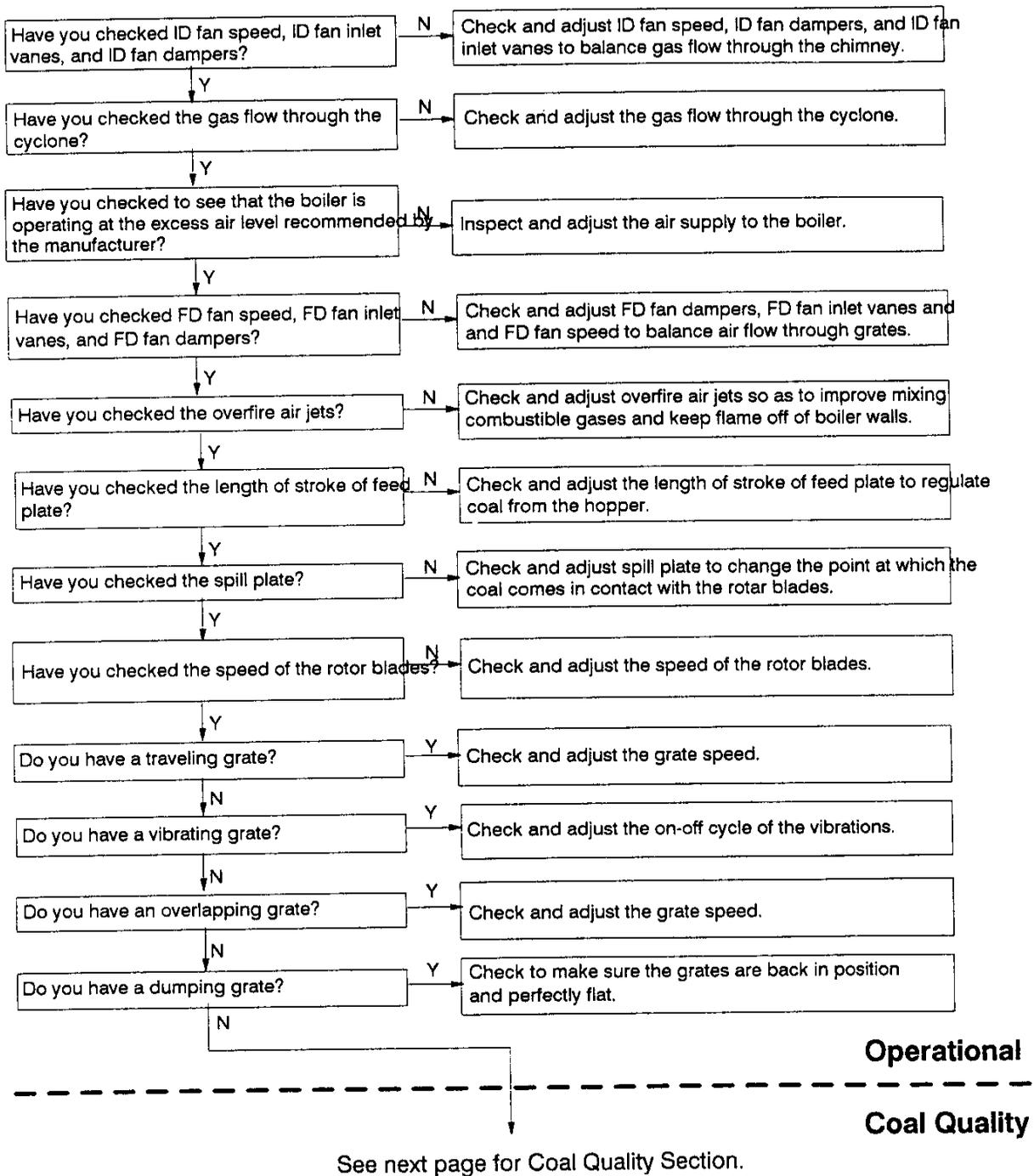
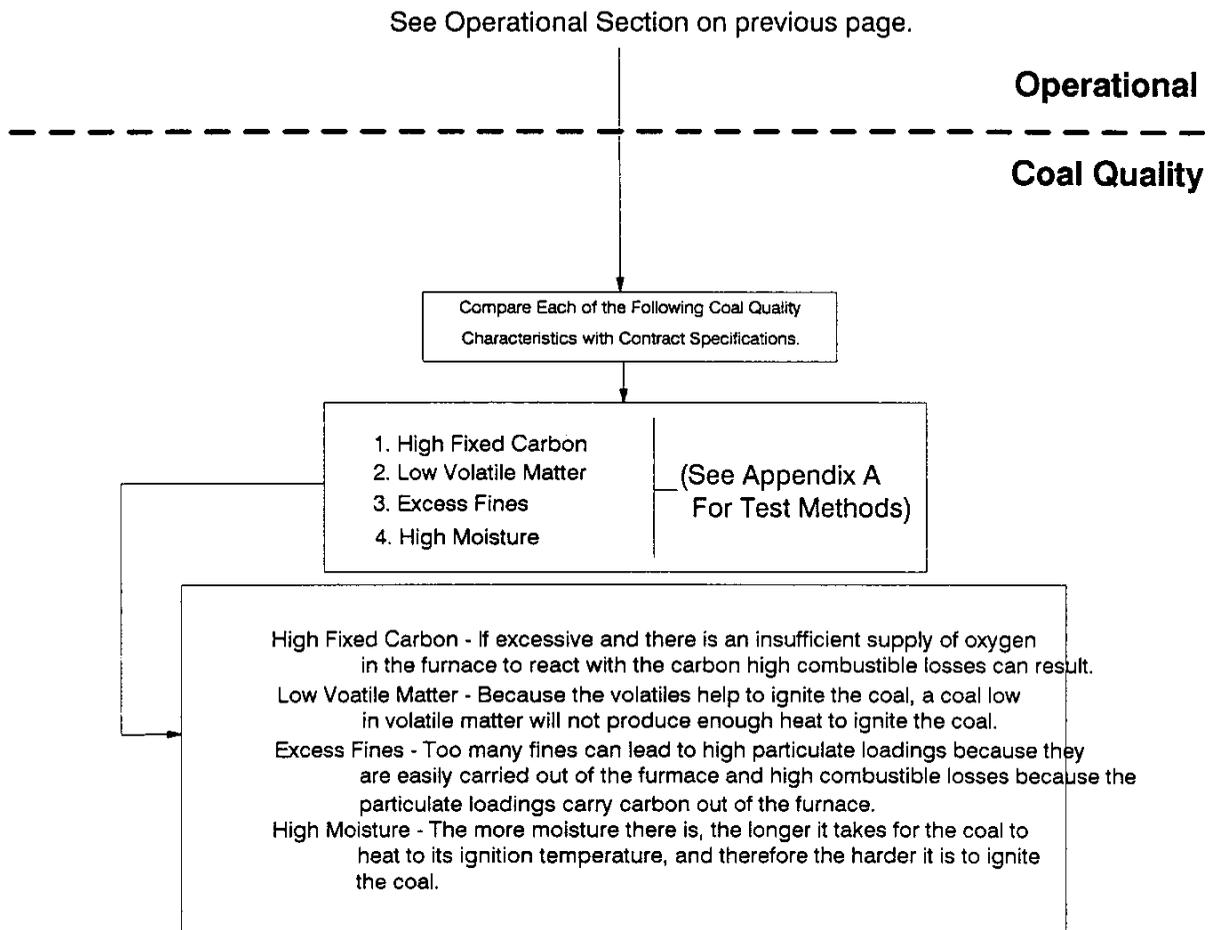


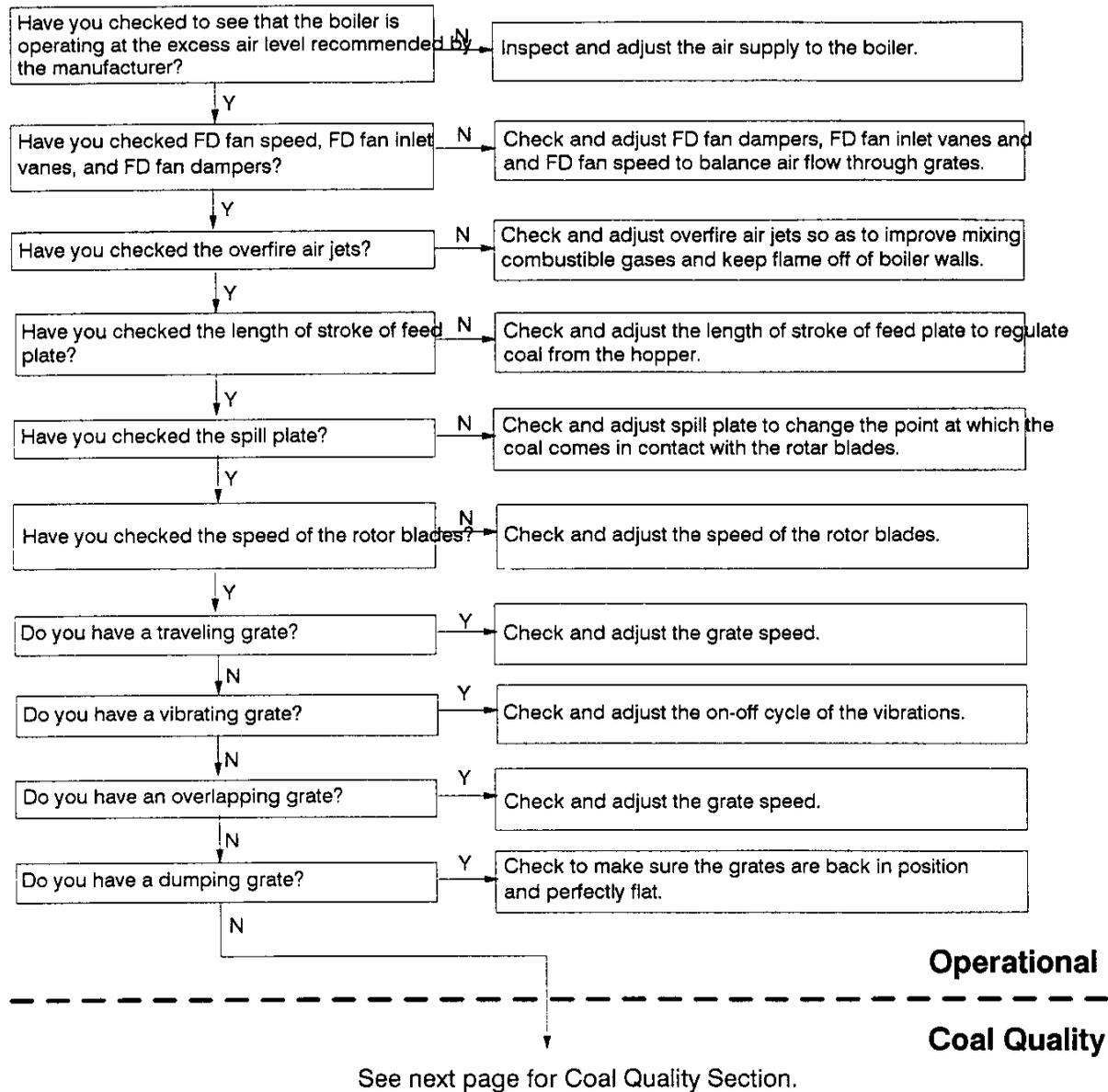
FIGURE 2-91: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM For Carbon Burnout Of The Fly-Ash Recycle



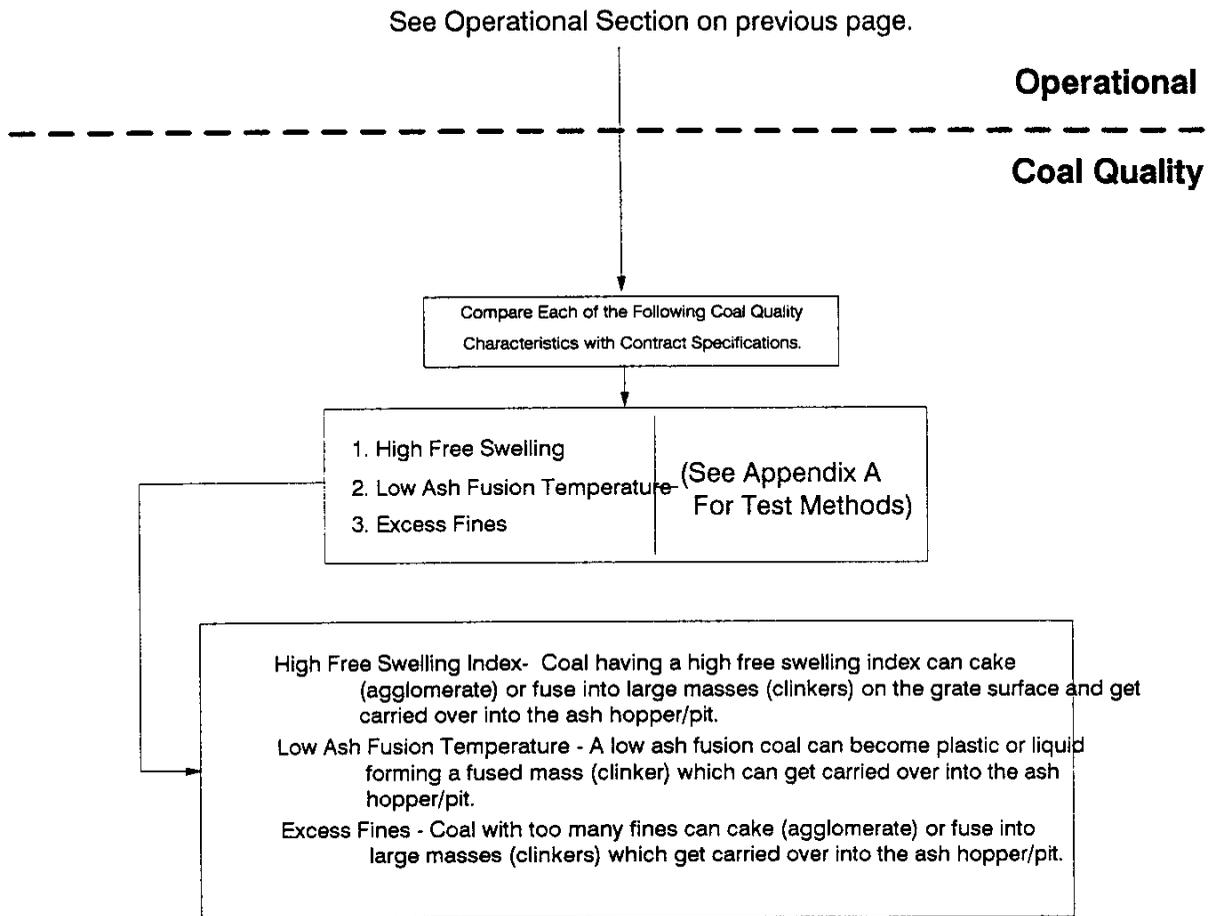
**FIGURE 2-91 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Fly-Ash Recycle**



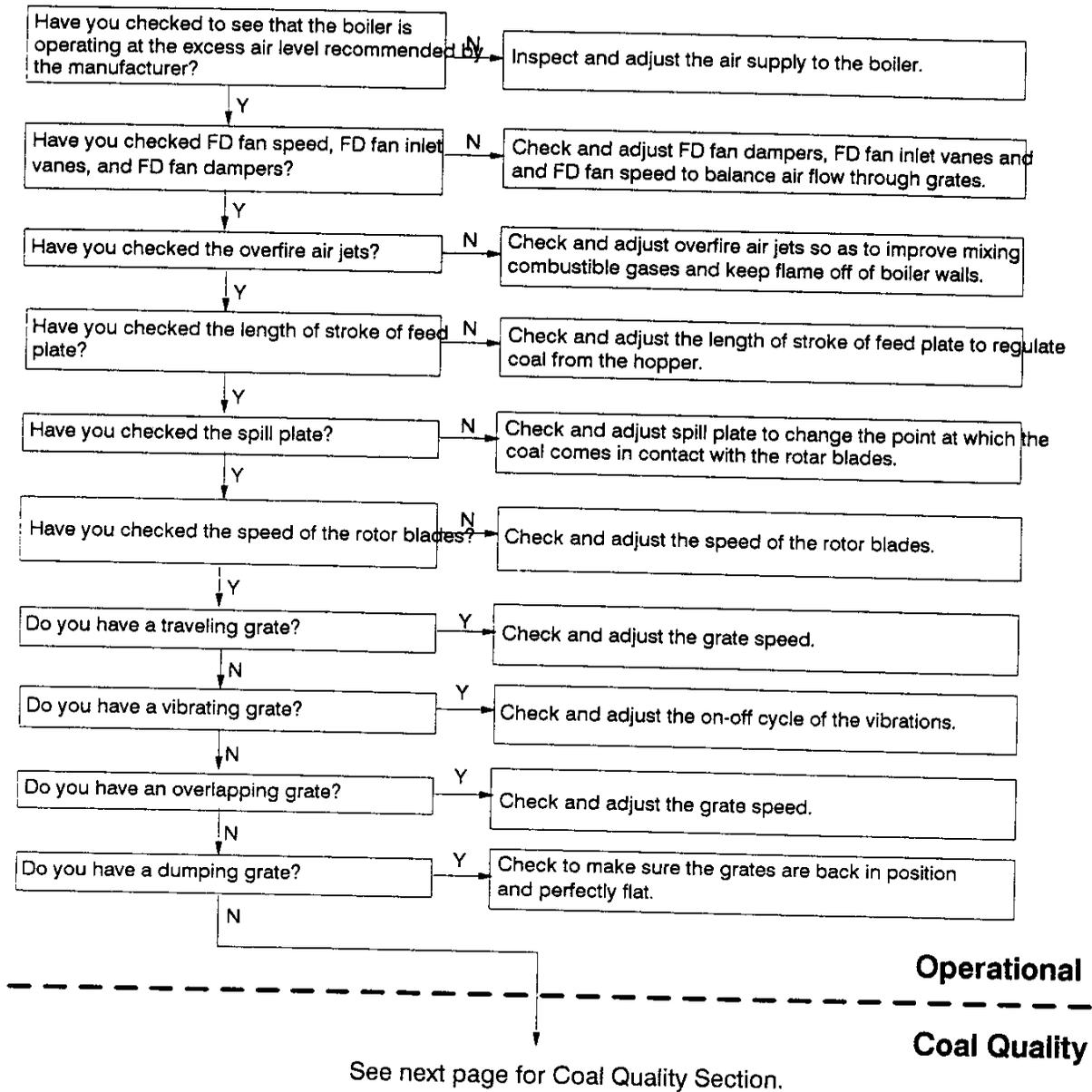
**FIGURE 2-92: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Clinkers In The Ash Pit/Hopper**



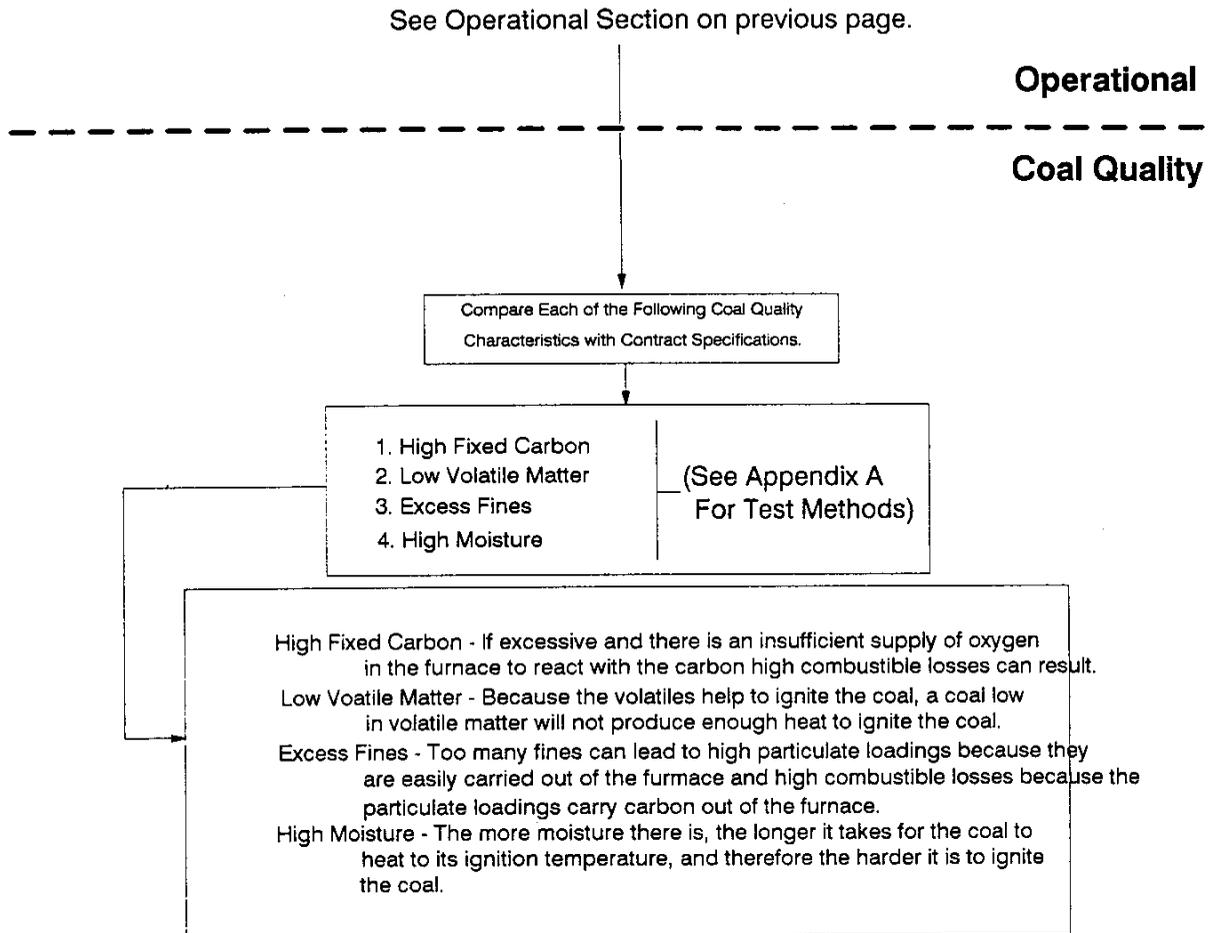
**FIGURE 2-92 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Clinkers In The Ash Pit/Hopper**



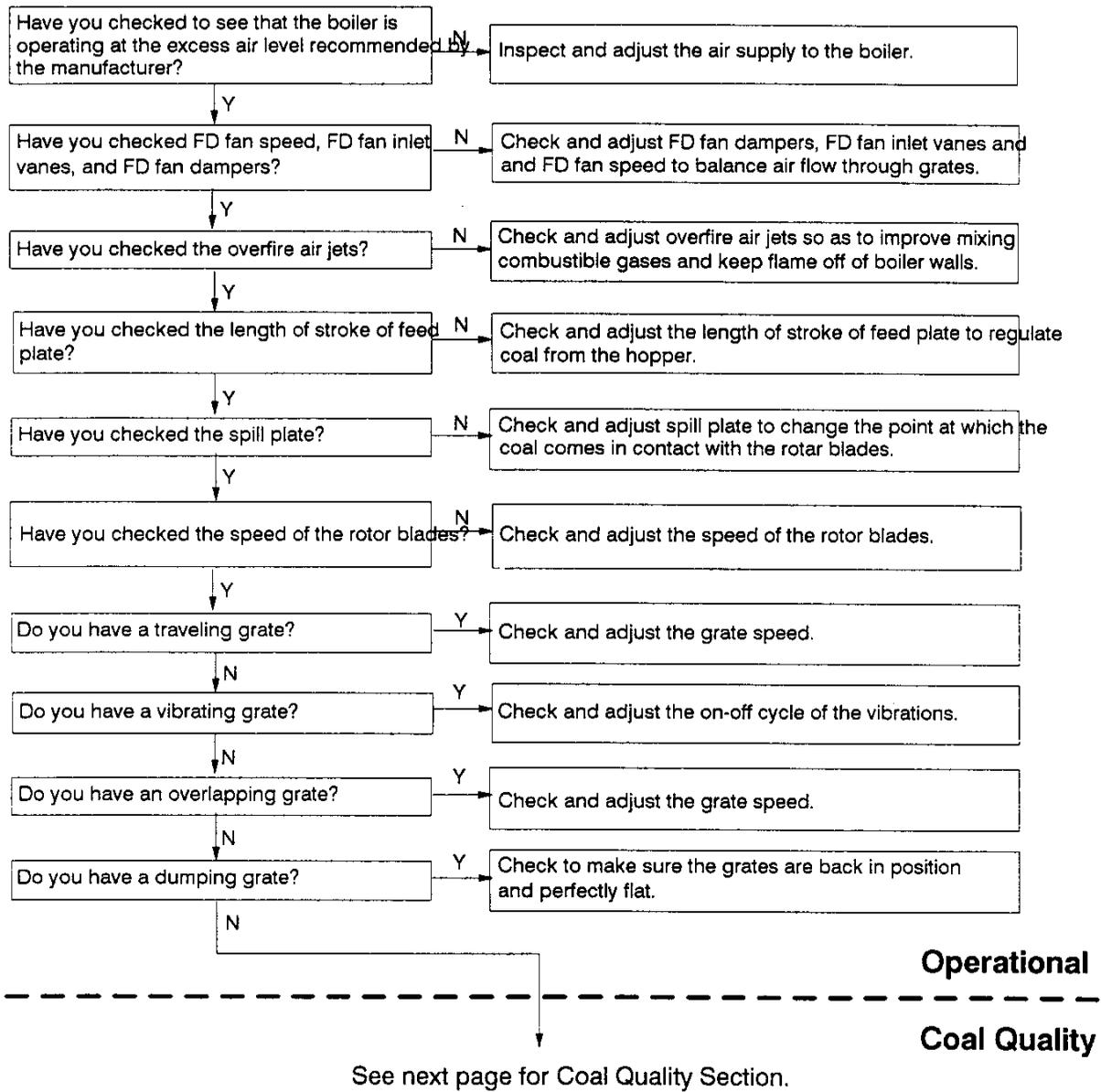
**FIGURE 2-93: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Ash Hopper/Pit**



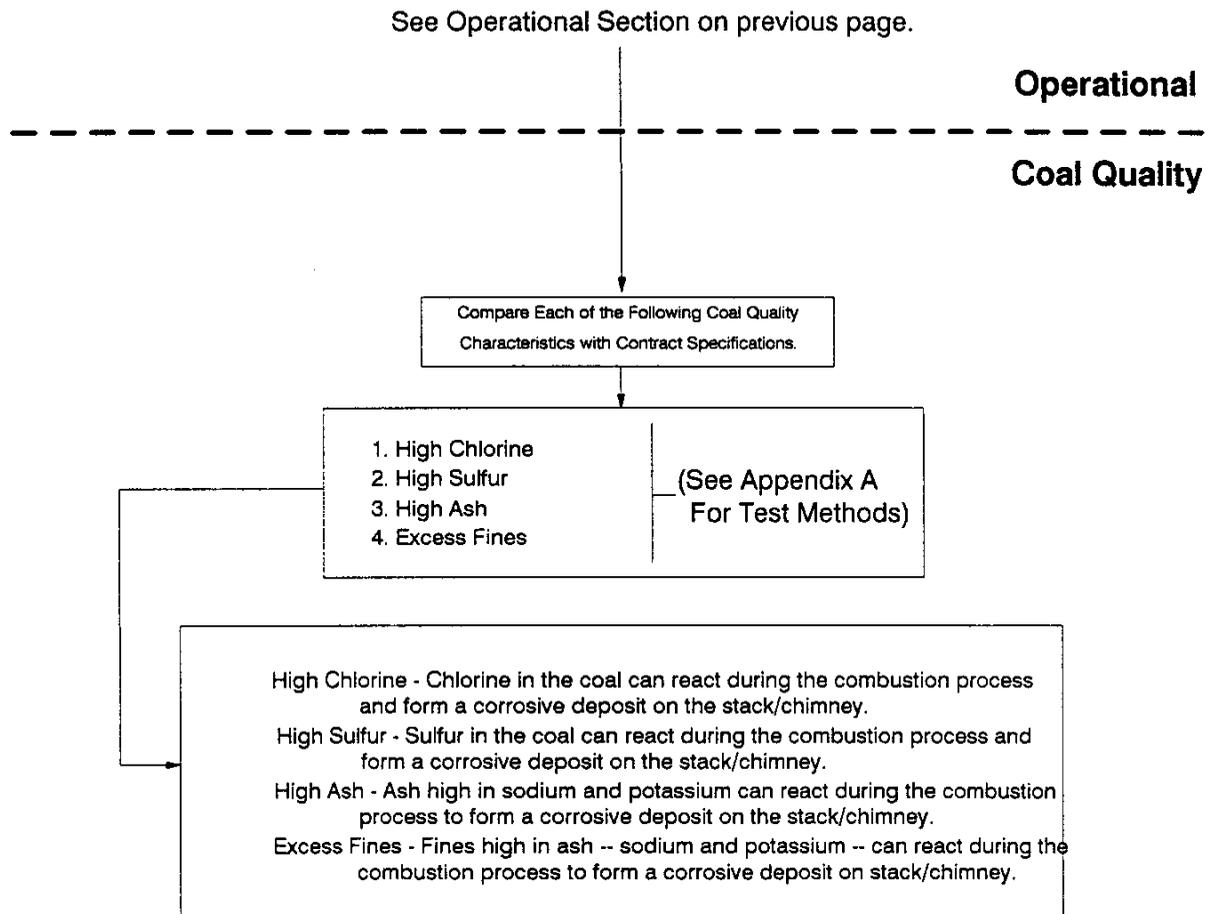
**FIGURE 2-93 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Ash Hopper/Pit**



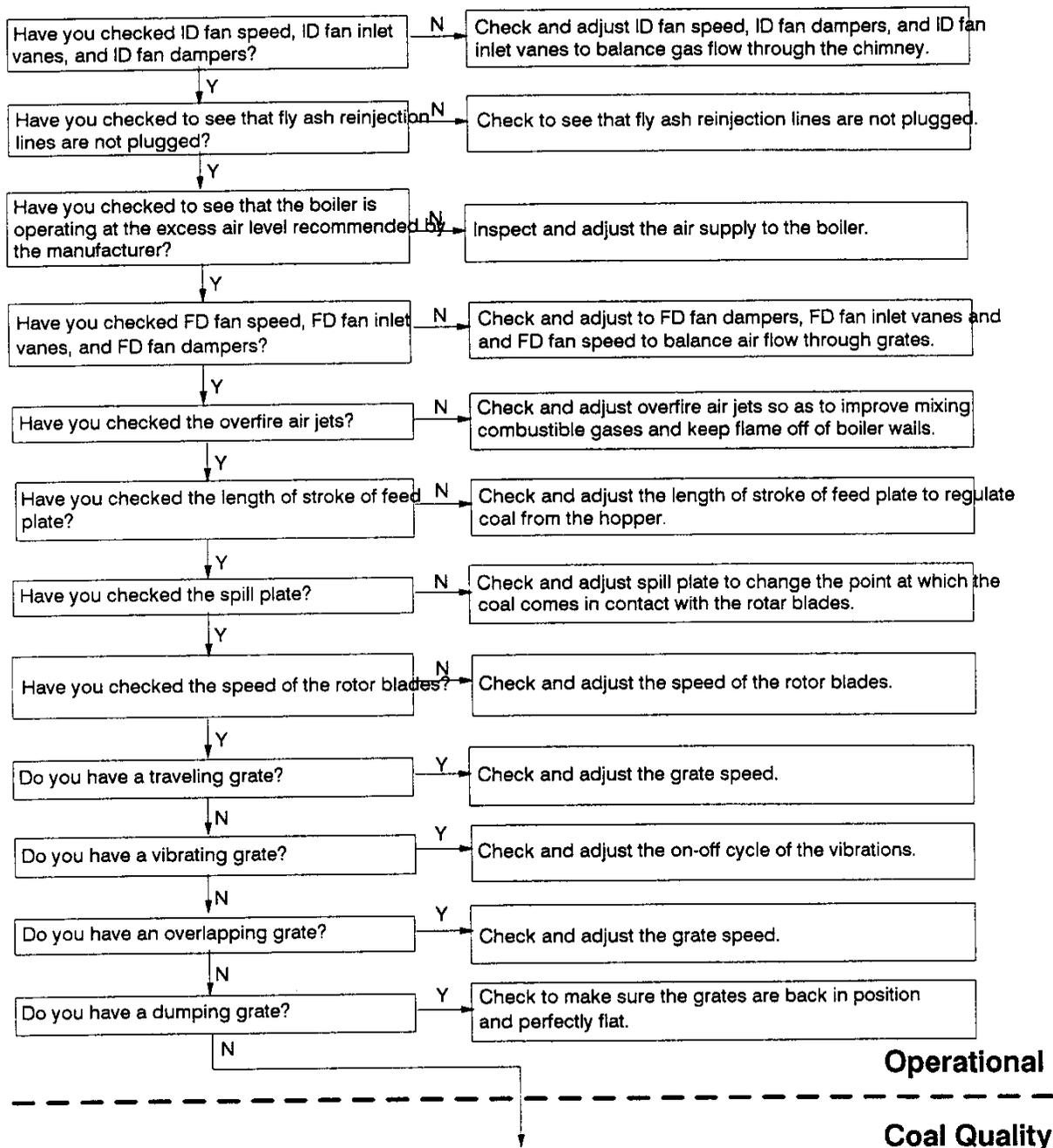
**FIGURE 2-94: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Stack/Chimney**



**FIGURE 2-94 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Corrosion Of The Stack/Chimney**

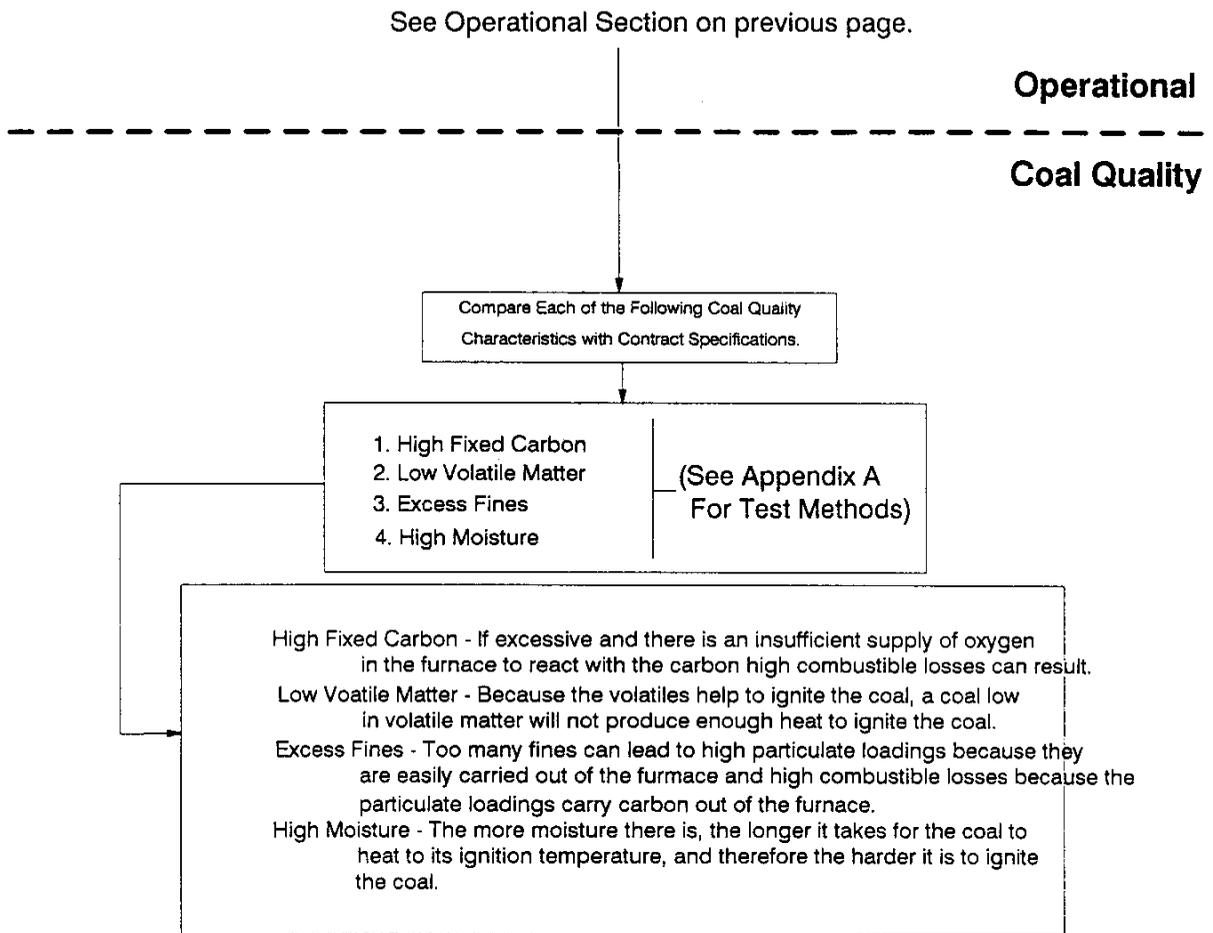


**FIGURE 2-95: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Stack/Chimney**



See next page for Coal Quality Section.

**FIGURE 2-95 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Carbon Burnout Of The Stack/Chimney**



**FIGURE 2-96: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking From The Stack/Chimney**

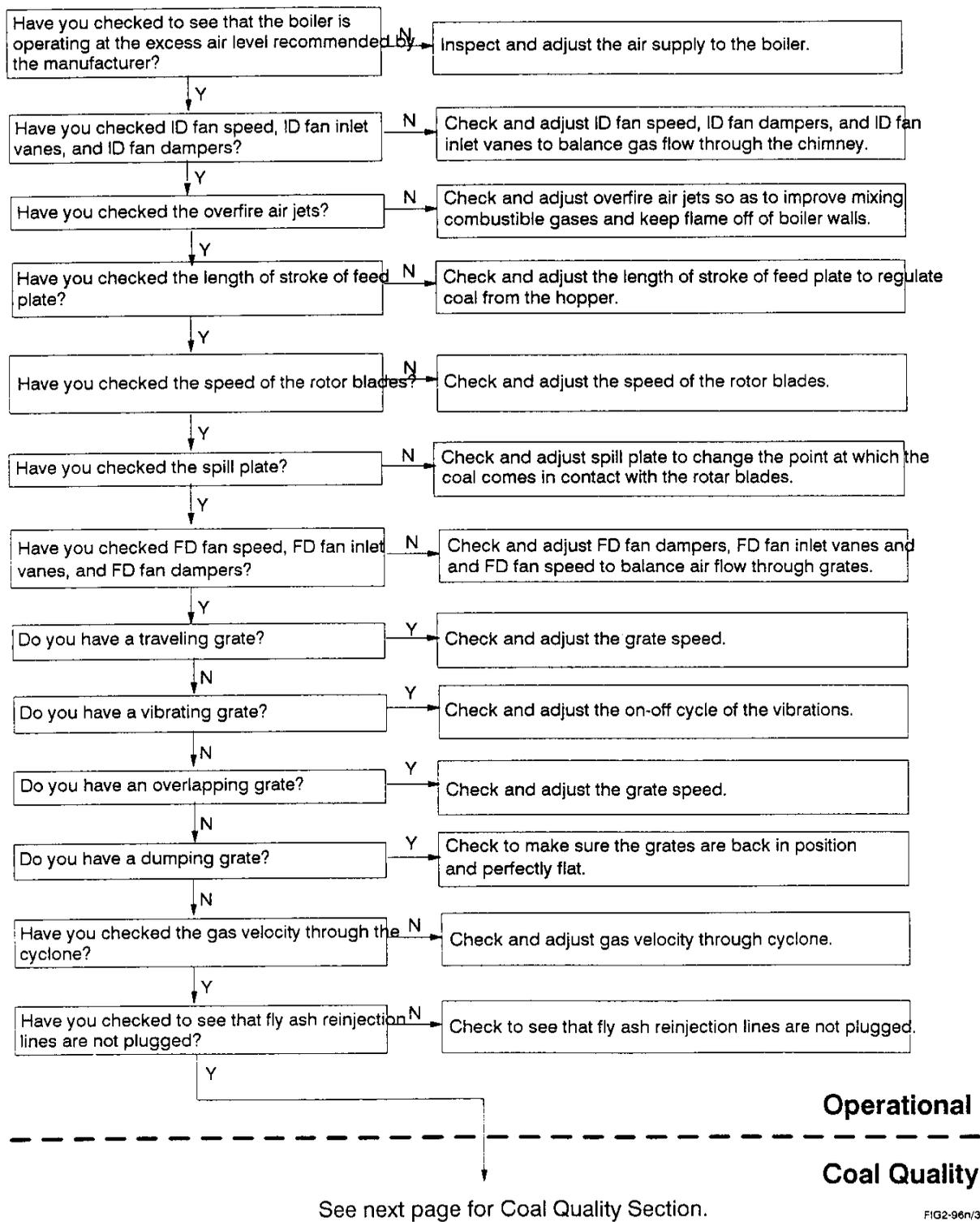
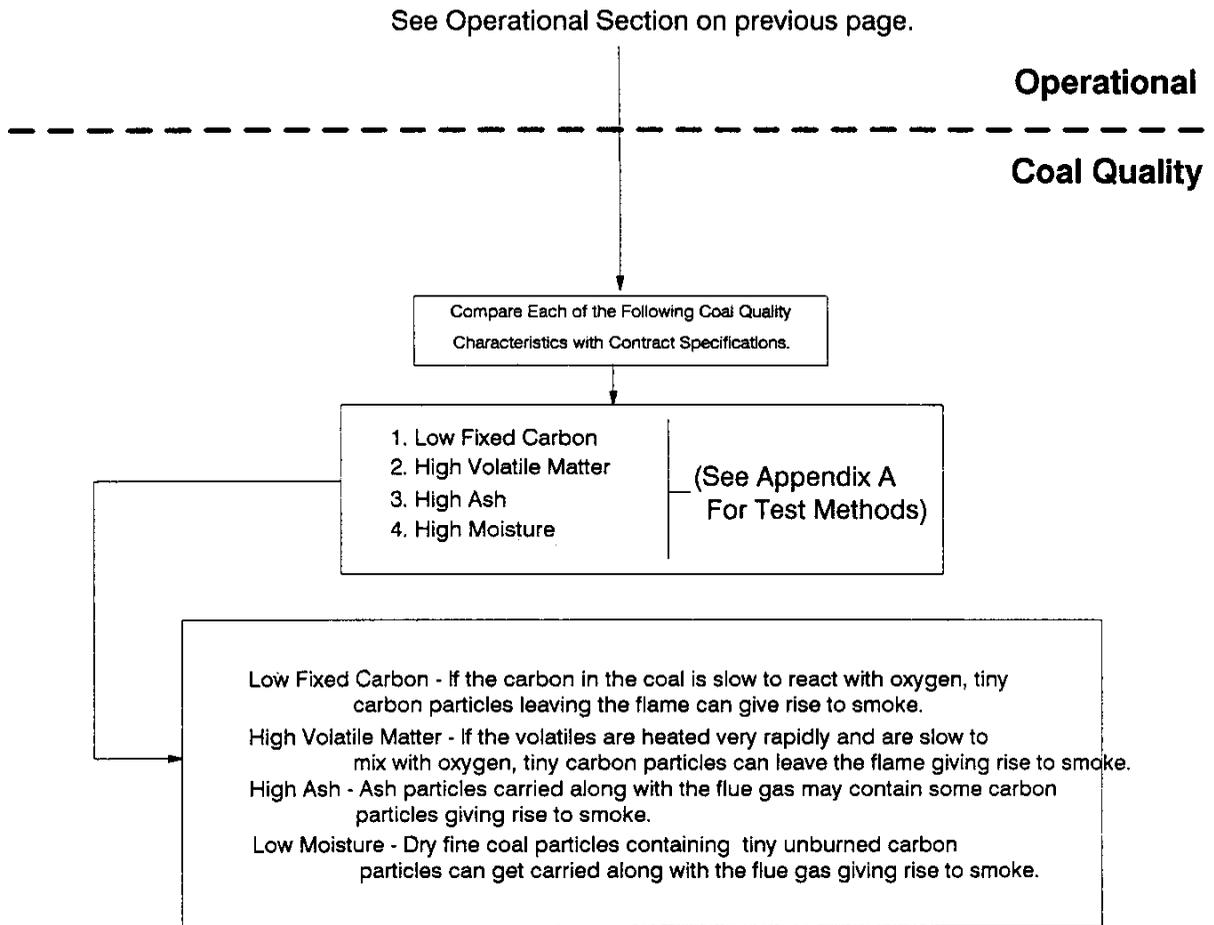
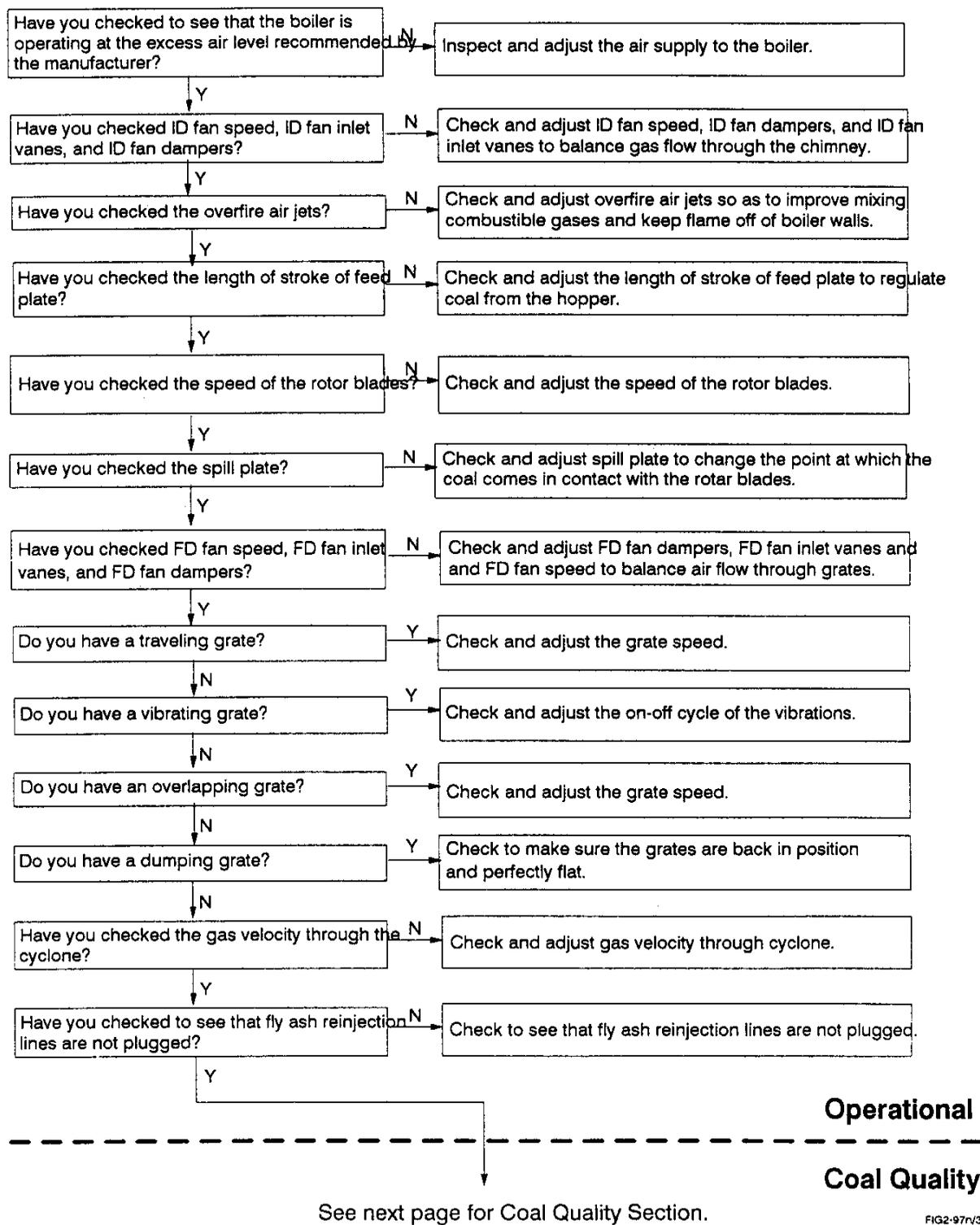


FIG2-96n/3

**FIGURE 2-96 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Smoking From The Stack/Chimney**



**FIGURE 2-97: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Stack/Chimney**



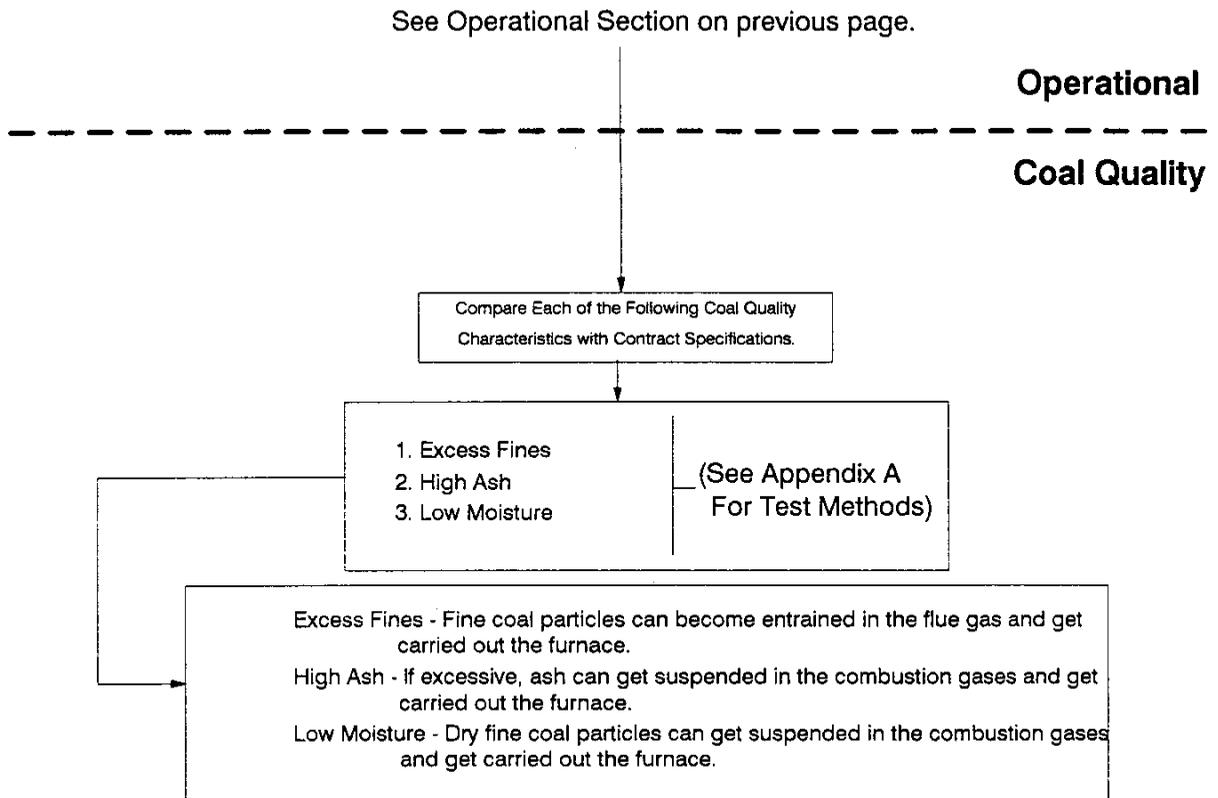
Operational

Coal Quality

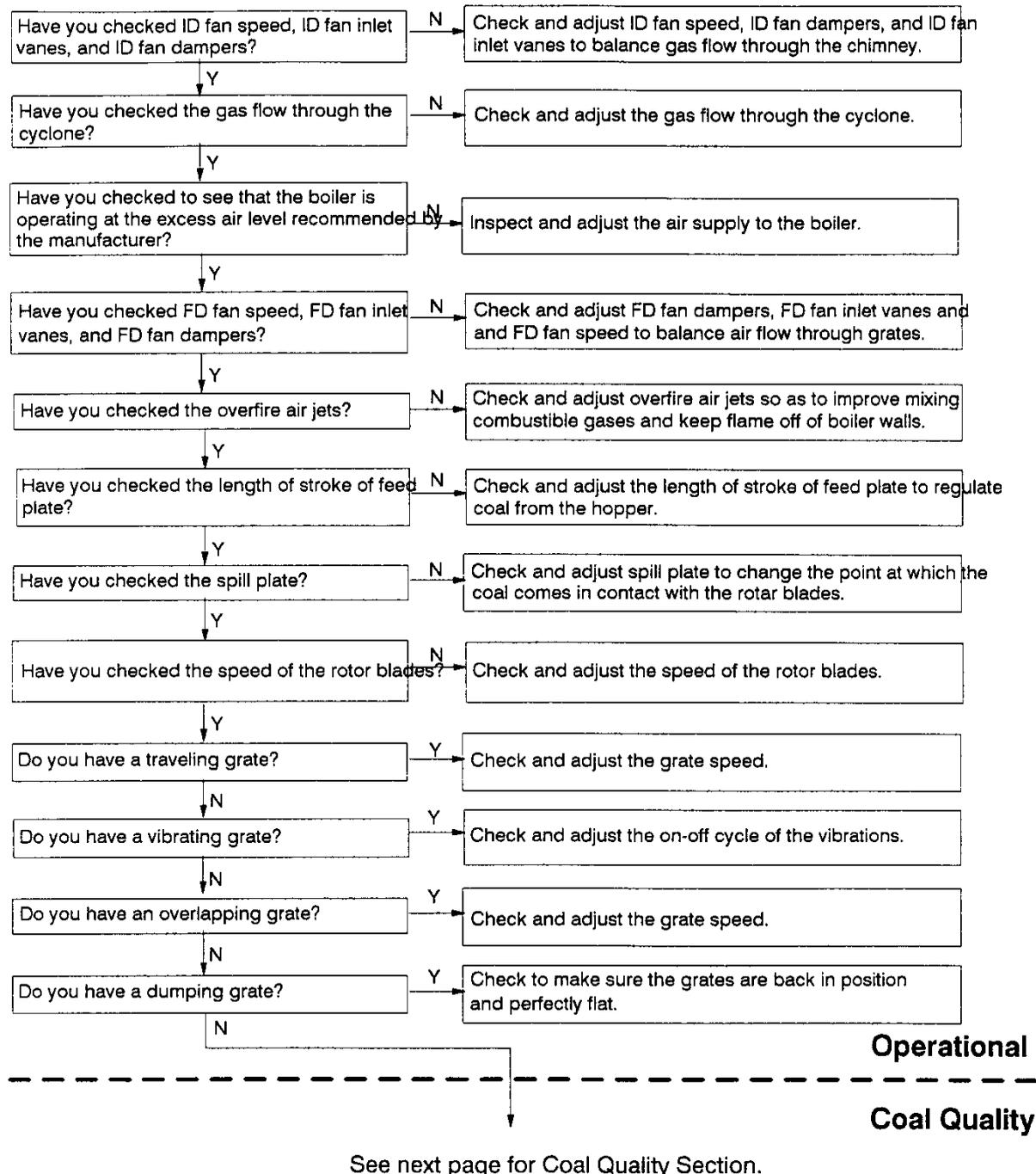
See next page for Coal Quality Section.

FIG2-97r/3

**FIGURE 2-97 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For Excess Particulate Emissions From The Stack/Chimney**



**FIGURE 2-98: SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For SO₂ Emissions From The Stack/Chimney**



**FIGURE 2-98 (continued): SPREADER STOKER TROUBLESHOOTING LOGIC DIAGRAM
For SO₂ Emissions From The Stack/Chimney**

