EDS, AMF and Auto Shear Description for TSF Horizon

The Emergency Disconnect Sequence (EDS) can be activated from either the Toolpusher's or Driller's Control Panels (TCP or DCP). The sequence is designed to close either the High Pressure Blind Shear Ram or the High Pressure Casing Shear Ram (depending on sequence selection), CLOSE the Choke and Kill Valves and UNLATCH the LMRP Connector (along with Choke/Kill Connectors). The EDS sequences are listed at the end of this document.

The hydraulic power to perform the sequence will be primarily from the conduit; however, H/P Close (either Blind or Casing) will get their hydraulic power from the stack mounted accumulators. The conduit will in turn get its supply from the HPU (Hydraulic Power Unit) from the surface. The HPU has at least two triplex pumps to supply the pressure to the pod via the conduit.

The electrical power and communication to the pods will be from mux umbilicals. The electrical power originates from the Power and Communication Cabinet (A & B) from the surface. Each cabinet has a dedicated UPS that will supply electrical power to sub-sea for a minimum of two hours should main power from the rig be interrupted or removed. The EDS commands to the sub-sea equipment originate at the DCP or TCP. The commands are then routed to the Power and Communication Cabinets (A & B) via the surface network. The commands are then sent to the SEM (Sub-sea Electronics Module) on the pod via the mux umbilical.

EDS, Blind Shear Ram (Regular) Close Sequence for TSF Horizon

T=0 (seconds)	Start EDS Command to Pods: Unlock all functions that were locked by BOP Workstation (CCU).
T=1	Command to Pods: HP Shear Close(Blind Ram) Retract Wellbore P/T Connector Lock ST Locks Stack Accumulator Charge OPEN Close Blind Shear Rams (for panel indication only) Close Upper Inner Choke Close Upper Outer Choke Close Lower Inner Choke Close Lower Outer Choke Close Upper Inner Kill Close Upper Outer Kill Close Lower Inner Kill Close Lower Outer Kill
T= 2	Commands to Pods: Vent Blind Shear Rams (for panel indication only)
T=5	Commands to Pods: Unlatch Choke/Kill Connector Primary Unlatch Choke/Kill Connector Secondary
T=18	Commands to Pods: Vent Upper Annular Preventer Vent Lower Annular Preventer Isolate - Stack Accumulator Charge Isolate - Stack Accumulator Dump Vent Blind Shear Rams Vent H/P Shear Close (Casing/Shear Ram) Vent Casing Shear Rams Vent Upper Inner Kill Vent Upper Outer Kill Vent Upper Outer Choke Vent Upper Inner Choke Vent Upper Pipe Ram Preventer Vent Lower Outer Choke Vent Lower Inner Choke Vent Middle Pipe Ram Preventer Vent Lower Pipe Ram Preventer Vent Lower Inner Kill Vent Lower Outer Kill Vent Wellhead Connector Gasket Release Vent Wellhead Connector Secondary

	Vent Wellhead Connector Primary Vent AutoShear
T=22	Commands to Pods: Vent High Pressure Shear Close (Blind/Shear Ram) Vent ST Locks
T=23	Commands to Pods: Output signal to HydraLift System (Dry Contact *) De-energize Stack Stinger Seals (Blue & Yellow)
T=25	Commands to Pods: Retract Stack Stingers Unlatch LMRP Connector Primary Unlatch LMRP connector Secondary
T=26	Commands to Pods: Energize LMRP Connector Regulator Quick Increase
T=46	EDS is complete Reset internal variables Commands to Pods Vent LMRP Connector Regulator Quick Increase

EDS, Casing Shear Ram (Casing) Close Sequence for TSF Horizon

T=0 (seconds)	Start EDS Command to Pods: Unlock all functions that were locked by BOP Workstation (CCU).
T=1	Command to Pods: Energize HP Shear Close(Casing Ram) Retract Wellbore Pressure/Temperature Connector Stack Accumulator Charge OPEN Close Casing Shear Rams (for panel indication only)
T= 2	Commands to Pods: Close Upper Inner Choke Close Upper Outer Choke Close Lower Inner Choke Close Lower Outer Choke Close Upper Inner Kill Close Upper Outer Kill Close Lower Inner Kill Close Lower Outer Kill Vent Casing Shear Rams (for panel indication only)
T=5	Commands to Pods: Unlatch Choke/Kill Connector Primary Unlatch Choke/Kill Connector Secondary
T=25	Commands to Pods: Energize HP Shear Close(Blind Ram) Close Blind Shear Rams (for panel indication only) Lock ST Locks
T=43	Commands to Pods: Vent Upper Annular Preventer Vent Lower Annular Preventer Isolate - Stack Accumulator Charge Isolate - Stack Accumulator Dump Vent Blind Shear Rams Vent H/P Shear Close (Casing/Shear Ram) Vent Casing Shear Rams Vent Upper Inner Kill Vent Upper Outer Kill Vent Upper Outer Choke Vent Upper Inner Choke Vent Upper Pipe Ram Preventer Vent Lower Outer Choke

	Vent Lower Inner Choke Vent Middle Pipe Ram Preventer Vent Lower Pipe Ram Preventer Vent Lower Inner Kill Vent Lower Outer Kill Vent Wellhead Connector Gasket Release Vent Wellhead Connector Secondary Vent Wellhead Connector Primary Vent AutoShear
T=51	Commands to Pods: Vent High Pressure Shear Close (Blind/Shear Ram) Vent ST Locks
T=52	Commands to Pods: Output signal to HydraLift System (Dry Contact *) De-energize Stack Stinger Seals (Blue & Yellow)
T=54	Commands to Pods: Retract Stack Stingers Unlatch LMRP Connector Primary Unlatch LMRP connector Secondary
T=55	Commands to Pods: Energize LMRP Connector Regulator Quick Increase
T=75	EDS is complete Reset internal variables Commands to Pods Vent LMRP Connector Regulator Quick Increase

The AMF (Automatic Mode Function) or deadman can be armed from either the Toolpusher's or Driller's Control Panels (TCP or DCP). Once armed, must be via the TCP or DCP, the AMF cards in the SEM look for three conditions. When and only if ALL conditions are satisfied then the AMF card will route power to the SEM (via the batteries inside the SEM) and execute the AMF sequence listed at the end of the document.

The three conditions are:

1. Loss of electrical power and communication from the mux umbilical.
2. Loss of communication from the other pod (or SEM).
3. Loss of conduit pressure.

The hydraulic power to perform the sequence will be from the stack mounted accumulators.

AMF Sequence for TSF Horizon

T=0 (seconds)	Commands to Pod: LMRP Stinger Extend Stack Stinger Extend
T=5	Commands to Pod: LMRP Stinger Seals Energize Stack Stinger Seals Energize
T=7	Commands to Pod: Vent LMRP Stinger Extend Vent Stack Stinger Extend H/P Blind Shear Ram Close
T=37	Vent H/P Blind Shear Ram Close
	End of Sequence

Auto Shear

A trigger valve between the LMRP and Stack plates will activate the Blind Shear Ram and Blind Shear ST Lock functions. The Auto Shear function must be "Armed" via the function on the DCP or TCP (Auto Shear, ARM).

The hydraulic power to close the Blind Shear Ram will be primarily from the stack mounted accumulators.