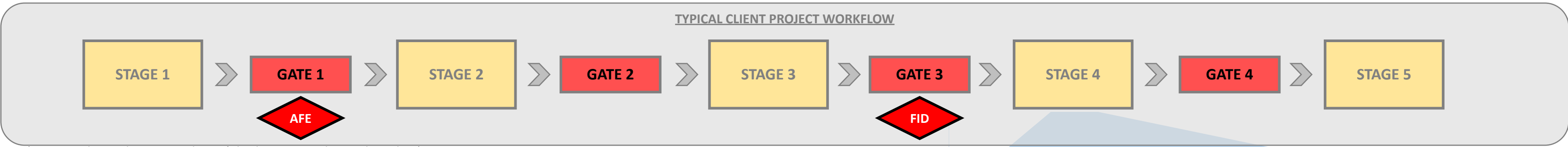
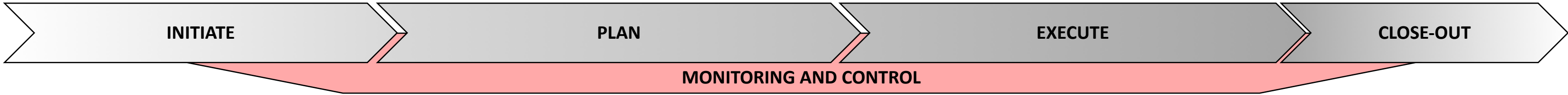




H+M INDUSTRIAL EPC PROJECT MANAGEMENT WORKFLOW



*AFE = Authorized For Expenditure (also known as Advanced Funding)
*FID = Final Investment Decision (also known as Full Funding)

FRONT END PLANNING (FEP)					DESIGN/BUILD		
Concept (FEP I)		Feasibility (FEP II)		FEED (FEP III)	Detailed Design (DD)	Construction	
also called Assess, Business Planning, Ballpark, or Rough Order of Magnitude		also called Select, Preliminary, Pre-Design or Pre-FEED		also called Define, Budget, Basic Engineering	also called Detailed Engineering, Execute	also called Execute	
REQUIREMENT FROM CLIENT	<ul style="list-style-type: none">•PRELIMINARY CLIENT SCOPE DOCUMENT (IF AVAILABLE)•EXISTING DRAWINGS & STUDIES•SAFETY REQUIREMENTS•CLIENT SPECIFICATIONS AND STANDARDS•PERMITTING REQUIREMENTS	<ul style="list-style-type: none">•BEDD QUESTIONNAIRE•FEL I PACKAGE (IF AVAILABLE)•EXISTING DRAWINGS & STUDIES•SAFETY REQUIREMENTS•CLIENT SPECIFICATIONS AND STANDARDS•PERMITTING REQUIREMENTS		<ul style="list-style-type: none">•BEDD QUESTIONNAIRE•FEL II PACKAGE (IF AVAILABLE)•EXISTING DRAWINGS & STUDIES•SAFETY REQUIREMENTS•CLIENT SPECIFICATIONS AND STANDARDS•PERMITTING REQUIREMENTS		<ul style="list-style-type: none">•BEDD QUESTIONNAIRE•FEL III PACKAGE (IF AVAILABLE)•EXISTING DRAWINGS & STUDIES•SAFETY REQUIREMENTS•CLIENT SPECIFICATIONS AND STANDARDS•PERMITTING REQUIREMENTS	<ul style="list-style-type: none">•DETAILED DESIGN IFC DRAWINGS•OWNER PROVIDED ITEMS (AS REQUIRED)
	<p>PRELIMINARY:</p> <p><u>OVERALL</u></p> <ul style="list-style-type: none">•JUSTIFICATION•SCOPE OF WORK•PROJECT SCHEDULE (LEVEL 2)•INFRASTRUCTURE REVIEW (POWER, UTILITIES, ETC.)•TIC ESTIMATE <p><u>PROCESS</u></p> <ul style="list-style-type: none">•PFD (BLOCK FLOW)•HEAT & MATERIAL BALANCE <p><u>MECHANICAL/PIPING</u></p> <ul style="list-style-type: none">•PLOT PLAN•MAJOR EQUIPMENT LIST <p><u>INSTRUMENTATION & ELECTRICAL</u></p> <ul style="list-style-type: none">•CONTROL PHILOSOPHY•INSTRUMENT LIST•LOCATION PLANS•AREA CLASSIFICATION REVIEW <p>Typically <5% of Eng cost TIC Estimate +/- 50%</p>	<p>PRELIMINARY:</p> <p><u>OVERALL</u></p> <ul style="list-style-type: none">•SCOPE OF WORK•PROJECT SCHEDULE (LEVEL 2)•TIC ESTIMATE <p><u>PROCESS</u></p> <ul style="list-style-type: none">•BLOCK FLOW DIAGRAM•P&ID•PROCESS DRAWING LIST•UTILITY CONSUMPTION <p><u>MECHANICAL/PIPING</u></p> <ul style="list-style-type: none">•PLOT PLAN•EQUIPMENT ARRANGEMENT PLAN•UTILITY REQUIREMENTS•MAJOR LINE ROUTING SCHEMATIC•LINE LIST•TIE-IN LIST•MAJOR EQUIPMENT CALCULATIONS•MAJOR EQUIPMENT PROCESS DATA SHEETS•MAJOR EQUIPMENT LIST•INITIAL QUOTES FOR MAJOR EQUIPMENT <p><u>CIVIL/STRUCTURAL</u></p> <ul style="list-style-type: none">•FOUNDATION LOCATION PLAN•FOUNDATION/STEEL SKETCHES•EXISTING SOIL ANALYSIS <p><u>INSTRUMENTATION & ELECTRICAL</u></p> <ul style="list-style-type: none">•SINGLE LINE DIAGRAMS•INSTRUMENT LIST•MAJOR ELECTRICAL EQUIPMENT LIST•CONTROL SYSTEM PHILOSOPHY•PLANS•MOTOR LIST <p>ISSUE FOR DESIGN (IFD):</p> <p><u>PROCESS</u></p> <ul style="list-style-type: none">•PFD•HEAT & MATERIAL BALANCE <p>Typically 5-10% of Eng. Cost TIC Estimate +/- 20% to 30%</p>		<p>PRELIMINARY:</p> <p><u>OVERALL</u></p> <ul style="list-style-type: none">•SCOPE OF WORK•PROJECT SCHEDULE (LEVEL 2)•TIC ESTIMATE <p><u>PROCESS</u></p> <ul style="list-style-type: none">•PSV SIZING <p><u>CIVIL/STRUCTURAL</u></p> <ul style="list-style-type: none">•STRUCTURAL DESIGN & ANALYSIS/SKETCHES•BUILDING PLANS & ELEVATION <p><u>INSTRUMENTATION & ELECTRICAL</u></p> <ul style="list-style-type: none">•DCS I/O COUNT•SPEC SHEETS <p>ISSUE FOR DESIGN (IFD):</p> <p><u>PROCESS</u></p> <ul style="list-style-type: none">•PFD•BLOCK FLOW DIAGRAM•HEAT & MATERIAL BALANCE•PROCESS DRAWING LIST•P&ID•HYDRAULIC STUDY <p><u>MECHANICAL/PIPING</u></p> <ul style="list-style-type: none">•PLOT PLAN•EQUIPMENT ARRANGEMENT PLAN•UTILITY REQUIREMENTS•3D MODEL / PIPING PLANS•LINE LIST•TIE-IN LIST•TIE-IN LOCATION PLAN•GLOBAL MATERIAL LIST•MAJOR EQUIPMENT LIST•PURCHASE-READY EQUIPMENT DATA SHEETS•MAJOR EQUIPMENT PROCESS DATA SHEETS•OUTLINE DRAWINGS•BID TAB FOR MAJOR EQUIPMENT•VENDOR DATA SHEETS <p><u>CIVIL/STRUCTURAL</u></p> <ul style="list-style-type: none">•FOUNDATION LOCATION PLAN•FOUNDATION SKETCHES•STEEL/CONCRETE ESTIMATION <p><u>INSTRUMENTATION & ELECTRICAL</u></p> <ul style="list-style-type: none">•SINGLE LINE DIAGRAMS•INSTRUMENT INDEX•MAJOR ELECTRICAL EQUIPMENT DETAILS•BLOCK DIAGRAMS•AREA CLASSIFICATION PLANS•CAUSE & EFFECTS (HAZOP)•MOTOR LIST <p>Typically 10-20% of Eng. Cost TIC Estimate +/- 10% to 15%</p>		<p>ISSUE FOR CONSTRUCTION (IFC):</p> <p><u>OVERALL</u></p> <ul style="list-style-type: none">•SCOPE OF WORK•PROJECT SCHEDULE (LEVEL 3)•CONSTRUCTABILITY REVIEW•TIC ESTIMATE <p><u>PROCESS</u></p> <ul style="list-style-type: none">•PFD•HEAT & MATERIAL BALANCE•PROCESS DRAWING LIST•PSV STUDY <p><u>MECHANICAL/PIPING</u></p> <ul style="list-style-type: none">•P&ID•PLOT PLAN•EQUIPMENT ARRANGEMENT PLAN•3D MODEL•LINE LIST•TIE-IN LIST•PIPING LAYOUT/PLANS & SECTIONS•PIPING STRESS ANALYSIS•EQUIPMENT TRIM DRAWING•SPECIALTY ITEM LIST•RELATED PIPING STANDARDS•EQUIPMENT REFERENCE DRAWINGS•FABRICATION ISOMETRICS w/ BOM•MAJOR EQUIPMENT PROCESS DATA SHEETS•MAJOR EQUIPMENT LIST•CERTIFIED EQUIPMENT DRAWINGS•EQUIPMENT CALCULATIONS•VENDOR DATA SHEETS•EQUIPMENT IOM (INSTALLATION OPERATING MANUAL) <p><u>CIVIL/STRUCTURAL</u></p> <ul style="list-style-type: none">•FOUNDATION LOCATION PLAN•FOUNDATION DRAWINGS•STRUCTURAL DESIGN & ANALYSIS/SKETCHES•BUILDING PLANS & ELEVATION•CONCRETE DETAILS•STEEL DETAILS•CALCULATION PACKAGE <p><u>INSTRUMENTATION & ELECTRICAL</u></p> <ul style="list-style-type: none">•SINGLE LINE DIAGRAMS•INSTRUMENT INDEX•ELECTRICAL CLASSIFICATION PLAN•CONTROLS LOGIC•SPECIFICATION SHEETS <p>Typically 60-75% of Eng. Cost TIC Estimate +/- 10%</p>	<p><u>OVERALL</u></p> <ul style="list-style-type: none">•PROJECT SCHEDULE (LEVEL 3)•PROJECT CONTROLS•ENGINEERING OVERSIGHT•CONSTRUCTION MANAGEMENT•SUBCONTRACT MANAGEMENT <p><u>SAFETY</u></p> <ul style="list-style-type: none">•TAKE IT PERSONAL (TIP PROGRAM)•JOB SAFETY ANALYSIS (JSA)•TOOLBOX TALKS <p><u>QUALITY ASSURANCE/QUALITY CONTROL</u></p> <ul style="list-style-type: none">•WELD LOG•NDT <p><u>PROCUREMENT</u></p> <ul style="list-style-type: none">•TAGGED EQUIPMENT•BULK MATERIALS <p><u>FABRICATION</u></p> <ul style="list-style-type: none">•PIPE SPOOLING•PIPE FABRICATION AND TESTING•VESSEL FABRICATION - U-STAMP <p><u>CONSTRUCTABILITY</u></p> <ul style="list-style-type: none">•SYSTEM BASED EXECUTION AND COMPLETION
STANDARD DELIVERABLES²	<ul style="list-style-type: none">•PROCESS DESIGN BASIS•IDENTIFICATION/EVALUATION OF LICENSING TECHNOLOGY•PRELIMINARY HSE GUIDELINES•GENERAL QUOTES•STANDARDS & SPECIFICATIONS•TIE-IN PHOTOS•FOUNDATION & STRUCTURAL SUPPORT SKETCHES•CIVIL/STRUCTURAL LAYOUT•CONSTRUCTABILITY REVIEW	<ul style="list-style-type: none">•3D SCAN•3D MODEL•HAZARD ANALYSIS•FLARE LOAD SUMMARY•SEWER SYSTEM DEFINITION•ENVIRONMENTAL ASSESSMENT PLAN•LIST OF PROPOSED LICENSORS•UPDATED DESIGN BASIS•PIPING STRESS ANALYSIS•PROBING DRAWINGS•EXISTING SUPPORT ANALYSIS•SAFETY CONTROL SYSTEM•CONSTRUCTABILITY REVIEW		<ul style="list-style-type: none">•3D SCAN•3D MODEL•HAZARD ANALYSIS•FLARE LOAD SUMMARY•SEWER SYSTEM DEFINITION•OPERATING GUIDELINES•HAZOP REPORT•UPDATED DESIGN BASIS•PSV DISTRIBUTION STUDY•EQUIPMENT INSULATION REQUIREMENTS•EQUIPMENT SPECIFICATION SHEETS•DEMOLITION DRAWINGS•PIPING INSULATION SCHEDULE•FIRE WATER SYSTEM DESIGN•PROCESS SEWER SYSTEM•PIPE SUPPORT DETAILS•PIPE STRESS ANALYSIS•DEMOLITION DRAWINGS•NEW SOIL STUDY•CONTAINMENT CALCULATIONS•SAFETY CONTROL SYSTEM•DEMOLITIONS DRAWINGS•IDENTIFY SUBSTATION, TRANSFORMER, OR FEEDER NEEDS•CONSTRUCTABILITY REVIEW		<ul style="list-style-type: none">•HAZARD ANALYSIS•PROCESS SPECIFIC DELIVERABLES•IFC DESIGN BASIS AND ASSUMPTIONS•FINAL EQUIPMENT INSULATION•UNDERGROUND PLAN•FIREWATER PLAN•DEMOLITION DRAWINGS•PIPE SUPPORT DETAILS•DEMOLITION DRAWINGS•NEW SOIL STUDY•CONTAINMENT CALCULATIONS•GRADING PLAN•SAFETY CONTROL SYSTEM•MOTOR LIST•DEMOLITIONS DRAWINGS•IDENTIFY SUBSTATION, TRANSFORMER, OR FEEDER NEEDS•ELECTRICAL HEAT TRACING•LIGHTING•GAS/FIRE DETECTORS•ESD'S•PROGRAMMING	<ul style="list-style-type: none">•PROGRESS TRACKING BY DISCIPLINE•PROCUREMENT OF TAGGED EQUIPMENT
OPTIONAL/EARLY DELIVERABLES³							

NOTES:
¹ Design/Build execution contingent upon all applicable FEL activities sufficiently complete.
² Standard deliverables may vary depending on client requirements, provided items, project drivers, characteristics and risk.
³ Optional deliverables contingent upon project scope and client requirements. Early deliverables dependent on client priorities and specific project needs.