

EGT System and Tubular Storage, Maintenance, and Test Recommendations**Purpose**

The purpose of this document is to communicate the requirements necessary to preserve and maintain Enventure Global Technology (EGT) products in optimal, ready for use condition. The Solid Expandable Tubular (SET[®]) System and SameDrift[™] System are designed, manufactured, assembled, and tested to strict specifications. This guideline contains the recommended preservation, preventive maintenance, inspection, test activities, and frequencies for EGT product assemblies and service-related products (SRP).

Scope

This procedure applies to all EGT locations and SRP and serves as the recommended practice for all customer owned property.


Responsibilities

- Engineering, Operations, Supply Chain, and other process owners shall establish and oversee process controls to adequately identify, handle, store, preserve, package, transport, inspect, maintenance, redress, repair, make-up, test, and accept criteria for EGT equipment.
- Managers shall ensure training and implementation of this procedure according to business needs and/or customer requirements.
- Sales and/or Operations shall maintain consistent communications with customers about customer owned property and related inspection and maintenance needs.
- Supply Chain and Quality Control will perform assembly and assembly related inspection and testing processes according to EGT Process Control Plans (PCPs) and/or client requirements.

Identification, Traceability, and General Information

1. EGT recommended preservation, preventive maintenance, and test activities will be delegated accordingly and may be based on risk, system reliability, usage history, experience, industry recommended practices, relevant codes and standards, original equipment manufacture's guidelines, or other applicable requirements. These recommendations extend to idle/returned customer owned property but are contingent upon customer approval of activities. Customer owned property under EGT control shall fulfil the requirements of Control of Customer Property GL-QMS-STD-0009.
2. EGT products are identified and traceable according to the following, as applicable:
 - Identification, Status, and Traceability GL-QMS-STD-0002
 - Traceability – Serial Number Identification F02.01012
 - Traceability – Batch Identification F02.01015
 - Identification and Marking Expandable Thread F10.00065
3. EGT systematically maintains an inventory list and identifies SRP/ equipment and critical spare part requirements by the customer and/or technical requirements, including those recommended by the original equipment manufacturer (OEM). The job specific information is defined on the SET design, Goods Movement Ticket (GMT), and Load Out and Equipment Trace Lists based on the service and technical requirements, and contingency needs. As required, critical spare parts are identified, maintained, inspected, and/or tested prior to use.

NOTE

 Prior to using any tool or equipment, a visual inspection is performed to ensure no noticeable damage and to verify and ensure accurate traceability information on the equipment (i.e., serial/part number, batch, etc.).


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4. EGT equipment usage is tracked, as necessary, via GMT/Equipment Trace Lists, Dynamics, and/or operational job file.

Storage and Preservation Recommendations

1. Storing EGT products in a manner outside the recommended conditions or outside the monitoring frequency, may compromise quality, functionality, and integrity of the systems, tubulars, and accessories.

- The main risks to storage in less-than-ideal conditions are:
 - Pre-mature corrosion to the expandable pipe, pipe connectors, pipe internal coating, service tools, and launcher assemblies.
 - Deterioration of elastomer components such as O-rings, hanger seals, debris catcher cups, etc.
 - Internal seal integrity to work string components and assemblies which may jeopardize successful installation of EGT system.

NOTE
 All quality, healthy, safety, security, and environmental considerations should be assessed during storage, preservation, inspection, maintenance, and testing, such as shelf/rack and lifting capacities, packaging, material securement, spill containment, etc.

2. To ensure product integrity, the following are the recommended storage conditions:

Equipment Type	Items in customer possession (yard, warehouse, site, etc.)	Items in EGT possession (assessed based on frequency requirements and prior to load-out/location move)
Tubulars (Includes pup joints and liner hangers)	<ul style="list-style-type: none"> • Yard environment monitored and controlled based on weather conditions • Controlled environment • Free of high humidity • Free of prolonged exposure to elements (sun, rain, coastal conditions (salt), frigid conditions) 	<ul style="list-style-type: none"> • Yard environment monitored and controlled based on weather conditions
System assemblies (launcher/expansion/cone/jack assemblies, debris catchers, circulating subs)	In original crate/container, if possible, or: <ul style="list-style-type: none"> • Monitored and controlled based on weather conditions • Shelved in warehouse • Controlled environment • Free of high humidity • Free of prolonged exposure to elements (sun, rain, coastal conditions (salt), frigid conditions) 	<ul style="list-style-type: none"> • Controlled environment • Monitored and controlled based on weather conditions • Monitored and controlled based on handling practices
Accessory items and gangbox (EGT toolbox with misc. tools)	In original crate/container, if possible, or: <ul style="list-style-type: none"> • Monitored and controlled based on weather conditions • Shelved in warehouse • Controlled environment • Free of high humidity • Free of prolonged exposure to elements (sun, rain, coastal conditions (salt), frigid conditions) 	<ul style="list-style-type: none"> • Controlled environment • Monitored and controlled based on weather conditions • Monitored and controlled based on handling practices

3. EGT preserves, protects, and stores elastomeric components in a controlled environment according to:

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- Specification, General Packaging, Inspection, and Identification of Non-metallic Materials F04.00584
- Specification – General – Packaging – Storage of Elastomer Products F02.00602
- Specification – Elastomer Expandable Hanger Tools F02.00600

4. EGT preserves, protects, and stores equipment with rotary shouldered connections and seal surfaces to prevent degradation and damages.

5. Racking and storing expandable tubulars requires that basic handling, packaging, and transportation guidelines are observed. If removed from bolsters/econo-wraps/baskets, the following guidelines must be considered:

- Never store pipe directly on the ground, unstable ground, steel rails, on steel or concrete floors.
- Elevate the first tier of pipe at least 8 inches above solid ground to avoid moisture and dirt. EGT pipe may also be stored in approved holding containers (e.g., Drilltec Econo-rap.).
- To avoid bending the pipe or damaging the threads, rest the pipe body on wooden piers that are properly supported in 3 places and spaced 12 ft. apart (as approved by an EGT representative).
- Wood or composite stringers, which must be provided between layers, should be placed on the same vertical plane as the bottom 8” high piers.
- Layers must be chocked on each side to prevent rolling.
- No nails should protrude.
- The following table dictates the layer quantity by size and weight:

Casing Size	3.500	4.250	5.500	5.500	6.000	6.300	7.625	7.625	8.000	8.625	8.625	9.625	11.750	11.750	13.375	16.000
PPF	9.20	10.70	17.0	18.24	20.10	20.50	29.10	39.0	32.50	32.0	44.0	36.0	47.0	74.60	54.50	84.0
Layer Max	30	29	24	25	23	22	18	19	16	14	15	12	9	12	7	7

Note: For QHSE purposes and in accordance with API Recommended Practice RP 5C1, Enventure will not stack tubulars above 10 feet (3 m) in height.

- Casing should be stored with 2 bumper rings spaced 1 to 3 feet from the connections. When handling/transporting, 2 bumper rings should be used per EGT Systems Handling Procedure GL-QMS-SOP-0103, and for Loose/Offshore loads, 3 bumper rings should be used with one in the middle to prevent pipe body and/or connection damage.
- Casing with box-end OD sleeves must have the sleeves removed. Always ensure that the thread protectors are tightened.
- Liner hangers must have protective UV wrap along with lamiflex (Enventure provided).

6. All EGT products shall be preserved according to the relevant product information reports (PIRs), assembly instructions, packaging, handling, and transportation instructions, and/or preservation and maintenance instructions (Pipe Inspection and Maintenance). Preservation may include, but is not limited to, storage conditions, packaging/crating, corrosion inhibitor, grease, thread protectors, or lamiflex.

EGT System and Tubular Storage, Maintenance, and Test Recommendations**Inspection and Testing Interval and Criteria**

1. EGT performs and controls processes related to machining, supply chain, and assembly through first article inspections, when required. EGT also receives inspection GL-QMS-WI-0105 prior to assembly or storage, and other relevant assembly activities.
 - Preventive maintenance, inspection, testing, and/or SRP validation occurs for equipment prior to the execution of service, which is guided by EGT Process Control Plans (PCPs) and/or assembly, inspection, and test instructions.
2. Regardless of the storage conditions, the minimum frequency of inspection should occur at the recommended intervals of 12/24/36 months for all equipment types with the exception of the recommended intervals of 12/18/24 for SameDrift™ ID coated system assemblies (expansion assembly, jack, and cone).
 - Customer owned property under EGT control shall fulfil the requirements of Control of Customer Property GL-QMS-STD-0009 which requires customer approval for inspection, testing, and maintenance.
 - The storage cycle begins the day equipment leaves an EGT's facility, after returning from a cancelled job, or unused equipment from a completed job.
 - Inspections and testing practices will be recorded at the recommended intervals.
3. In order to ensure EGT products are “ready to use” or to identify products requiring remediation, it is recommended that the following inspections, per EGT's quality standard, be performed at the following time intervals:
 - Systems should be inspected shortly after clearing customs to ensure that there is no saltwater trapped in the container, assemblies, pipe, or accessories. Pipe that has been transported utilizing scalloped wood spacer boards should be inspected to ensure there is no trapped moisture.
 - Visual inspection should occur every 6-12 months if equipment is stored as recommended in the Storage Recommendations table.
 - Visual inspection every 6 months or a request for inspection should occur if storage conditions or storage location has/have changed or are outside the Storage Recommendations. Conditions will be recorded thorough GL-QMS-F-0100 Casing and Visual Inspection Checklist.
 - Reference EGT Systems Packaging, Handling, and Transportation GL-OPS-SOP-0004 for handling and storage requirements in arctic conditions (ambient temperature at or below 20°F) and contact EGT Engineering and/or Operations for inspection and maintenance guidance.
4. EGT's Pressure Test of Work String Components GL-QMS-WI-0100 must occur based on equipment category and the respective defined intervals after the previous EGT pressure test date, regardless of storage conditions or if degradation has not been observed during the relevant visual inspections (risk mitigation).
5. SameDrift™ expansion, SameDrift™ jack, and SameDrift™ cone assemblies passing 24 months and all other assemblies including solid cone launchers, debris catchers, circulating crossovers, etc. passing 36 months, require a full disassembly, redress of seal components, and pressure testing.

Inspection Requirements

1. All equipment should undergo preventive maintenance, inspection, or testing and SRP validation prior to the execution of service, guided by EGT Process Control Plans (PCPs) and/or assembly, inspection, and test instructions.
2. Ongoing inspection requirements should be performed at the described interval as follows:
 - Casing – should be inspected by qualified EGT personnel or qualified designee as per EGT's Pipe Inspection and Maintenance Procedure GL-QMS-WI-0102 and Pipe Inspection Form GL-QMS-F-0123 or Casing Visual Inspection Checklist GL-QMS-F-0100.

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- Casing inspection must be performed with casing on racks to allow 360-degree roll and access to full length of joint(s).
 - System assemblies – should be inspected visually for general damage to holding container, wrapping material, free of water contamination, and assembly. Also, see risk minimization above for pressure test integrity.
 - Accessory items and gangbox – should be inspected visually for general damage.
3. Returned equipment is visually inspected. Other preventive maintenance and testing may occur (i.e., nondestructive testing, disassembly, maintenance, or repair).
4. Any equipment not conforming to requirements shall be identified and follow the control of nonconformances and/or management of change, which may, in maintenance, redress, repair, or other determination (based on nonconformance risk, costs, etc.) with instruction provided from a relevant authority (i.e., engineering, customer, etc.).

Maintenance, Redress, Repair, Modifications, Rework/Remanufacture, and Make-up

1. Maintenance, repairs, modifications, or remanufacture of equipment:
- Maintenance will be completed as required based on inspection and testing results or OEM recommendation. These activities may be guided by EGT processes and specifications and documented for recordkeeping.
 - Repair, rework, or remanufacture of equipment is guided by EGT or manufacturer specifications and instructions, documented on job travelers, nonconformance dispositions, or other methods. If equipment cannot be repaired appropriately, the management of change (MOC) must be used to determine the appropriate course of action.
 - If equipment is upgraded during the maintenance process, it must be documented (nonconformance disposition, engineering disposition, equipment trace list, systematic change, etc.).
 - Any modifications from original equipment design must be evaluated and authorized (i.e., utilizing the nonconformance process and/or MOC).
 - Verification of maintenance, repair, modifications, remanufacturing/rework will occur through inspections and/or testing based on acceptance criteria of EGT or OEM specifications/instructions.
2. Redress of equipment
- All company equipment that requires a redress will be maintained per EGT, operator, and/or manufacturer specifications and guidelines.
 - The redress specifications required will be documented and approved by the relevant approval authority prior to beginning maintenance.
 - All redress specifications will be documented.
 - All parts utilized in redress procedures will be of the same or higher quality as originally provided by the manufacturer and documented on the GMT/Equipment Trace Lists, Dynamics, and/or operational job file.
3. Make-Up of Equipment
- The make-up of equipment will be completed within the appropriate parameters per EGT or manufacturer specifications with traceable make-up data retained.
 - All equipment will be returned to the original make-up configuration and torqued/secured as per EGT or manufacturer specifications.
 - If equipment cannot be made-up appropriately, management must be notified and the MOC must be used to determine the appropriate course of action.

EGT System and Tubular Storage, Maintenance, and Test Recommendations**Testing, Acceptance Criteria, SRP Validation, and MOC**

1. Inspection and testing equipment provide controls to ensure equipment integrity is intact and that the design acceptance criteria are maintained throughout all processes (preparation, maintenance, redress, repair, modifications, rework/remanufacture, and make-up).
 - When necessary, final testing may be outsourced.
 - Inspection and testing may include, but is not limited to:
 - function testing (through research and development/engineering)
 - receiving and load out inspection (QIR, casing, and equipment trace lists, etc.)
 - dimensional or fit inspection and testing (QIR, dimensional logs)
 - nondestructive testing (SEA, MPI, PAUT, etc.)
 - pressure testing (hydro-testing)
 - other testing methods
 - All testing will be completed per EGT, manufacturer, and/or client requirements and guidelines.
 - Acceptance criteria is determined for service-related product by EGT Specifications, PCP, COC, successful inspection and testing results, and/or other specified parameters.
 - Testing documentation that shows direct verification that service-related product may be used/reused, include quality inspection reports (QIR), EGT and/or outsourced documentation/reports on the SRP and/or processes used (NDT, pressure testing charts, etc.).
 - Original performance requirements that cannot be met undergo the MOC to determine if continued use is feasible.
2. This final testing of service-related product/equipment occurs during preparation according to PCP, prior to the execution of service, and serves as a validation of the SRP/equipment, assuming successful results with acceptance criteria.
3. Once equipment is complete with maintenance, inspection, and testing, the equipment will be returned to the appropriate staging or storage area. If the equipment is scheduled to be sent on a specific job, it will be staged by GMT (equipment package).
 - If an SRP/Equipment fails to meet required specification from PMIT, the SRP/Equipment will return to the beginning of the PMIT process, undergo the control of nonconformance or management of change process.

Handling, Packaging, and Transportation

EGT products should be packaged, handled, and transported according to EGT Systems Handling Procedure GL-QMS-SOP-0103, client specified requirements, and/or relevant operational procedures.

References

- API Q2
- ISO 9001
- Pipe Inspection Form GL-QMS-F-0123
- Pipe Inspection and Maintenance Procedure GL-QMS-WI-0102
- Pressure Test of Work String Components GL-QMS-WI-0100
- Control of Customer Owned Property GL-QMS-STD-0009
- Identification, Status, and Traceability GL-QMS-STD-0002
- Casing Visual Inspection Checklist GL-QMS-F-0100
- Traceability – Serial Number Identification F02.01012
- Traceability – Batch Identification F02.01015

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- Identification and Marking Expandable Thread F10.00065
- EGT Systems Handling Procedure GL-QMS-SOP-0103
- SET Design
- Goods Movement Ticket (GMT)
- Load Out and Equipment Trace Lists
- Receiving Inspection GL-QMS-WI-0105

Revision & Approval

Revision	Date	Change Made	Reviewed By	Authorized By
00	July 30, 2018	Converted from PD-7.4-002, Rev 9 originally published November 17, 2015	Bob West	Bob West
01	Aug. 11, 2020	Updated structure and references and revised to include SameDrift™.	Bob West / Markus Kaschke / Eric Connor / Matt Godfrey	Brian Hayes
02	Sept. 8, 2021	Minor revision to update bumper ring commentary and include notes	Bob West / Brian Gulley / Markus Kaschke / Tara Zapp-Dill	Bob West
03	Jan. 5, 2022	Modified to adjust inspection test interval	Tara Zapp-Dill / Bob West / Matt Meiners / Markus Kaschke	Brian Hayes
04	Feb. 9, 2022	Modified (e.g., Inspection and Testing Interval & Criteria) to reduce overlap with GL-QMS-WI-0100	Tara Zapp-Dill / Bob West / Matt Meiners / Markus Kaschke / Matt Godfrey	Brian Hayes
05	June 3, 2022	Clarified wording on #5 in the Inspection and Testing Interval and Criteria section.	Bob West / Matt Meiners / Markus Kaschke / Matt Godfrey	Tara Zapp-Dill