Turnpoint Solutions

Design

Registered office: Turnpoint Solutions
Riverside Centre, Level 18
123 Eagle Street
Brisbane QLD 4000

CMMS Integration Focus
Design Documentation

Reference	BarrierModel_CMMS_Focus.doc
Date Issued	02 October 2015
Version	Issue 0
Customer	Generic
By	Michael Mostert
Description	Technical design documentation containing specific technical information on the CMMS integration to the barrier model application.

Document Control

Revision Notation

Any / all subsequent revisions to this document are to be recorded by use of the Word track change facility. Such additions, changes or deletions are to remain part of the text of this Technical Design and are then to be accepted for inclusion in the next in turn version released.

Revision History

Date	Document Type	Release Version	Author
30 January 2014	Draft	A	Michael Mostert
Initial Draft			
Date	Document Type	Release Version	Author
02 Oct 2015	Definitive	0	Michael Mostert
Initial Release			

Date	Release / Version	Client Name
Signature for Acceptance		

References / Source

Glossary of Terms

TOPIC	DESCRIPTION
Region	A region is a collection of sites - region abbreviation code.
Sites	Sites are a specific data element in CMMS which represents a large fixed asset such as an Oil Platform.
Open work order	An open work order is defined by the work order status. Is the STATUS of a work order is not REJECTED, COMPLETED, CLOSED, CANCELLED, SUPERCEEDED
PM Work order	PM work orders are defined by the work order type– PM stands for preventative work orders which have come from the structured PM maintenance plan based on a predefined schedule.
CM Work orders	Corrective work orders. Normally these are only HIGH priority work orders which involve an emergency breakdown.
Safety Critical	By definition, this is based on the reason for work being set to SC
Backlog	Work that is past its latest finish date.
Deferrals	Work order is deferred based on an operational risk assessment. During the deferral process, the revised date on the work order is updated.
Safety Critical Element	A Safety Critical Element is a System or Equipment Type defined as critical to protection of People or Environment either in day-to-day operations or in case of an incident to prevent a Major Accident Hazard e.g. Fide & Gas Detection or Water Deluge. Safety Critical Elements form the 8 barriers protecting Asset Integrity PLUS 1 for environment. Safety Critical Elements contain Safety Critical Equipment e.g. a Fire & Gas Detection system contains Smoke Detectors. Performance Standards are used to define and measure the function of Safety Critical Elements to ensure they perform as required. A Performance Standard may describe that for a Fire & Gas detection system to function as required, at least 3 out or 4 Smoke Detectors operate. Preventative Maintenance is performed in the form of Assurance Activities on Systems and Equipment to verify that Performance Standards are being met.

Table of Contents

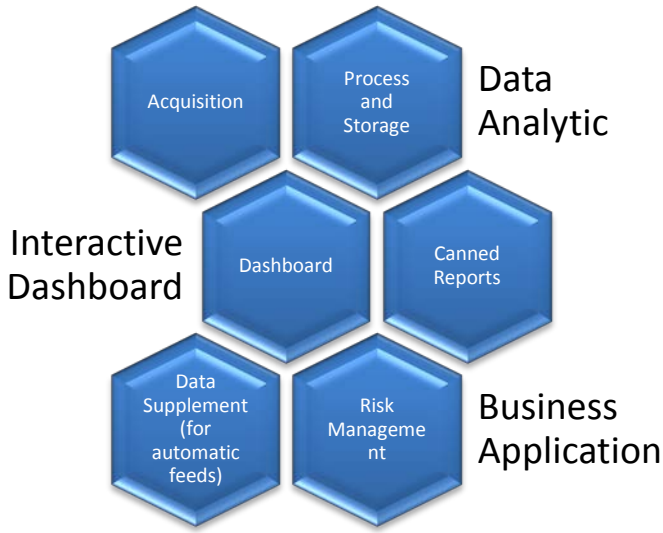
Introduction

Context

Barrier Model is a visual communication tool developed by TPSCO that identifies the risk profile for any given asset installation in a region focusing on 5 elements that contribute to cumulative risk assessment being process safety, operational risk assessment, safety critical risk assessment and human factors (or soft measures).

This document describes the specific integration into CMMS. As regions are deployed the barrier model has features which allow the automatic gathering of work order information. The specifications on which data within CMMS is used, is described in this document.

From a high level component perspective the barrier model is based on the following items. This document looks at the details within the acquisition piece which is where barrier model connects to CMMS.



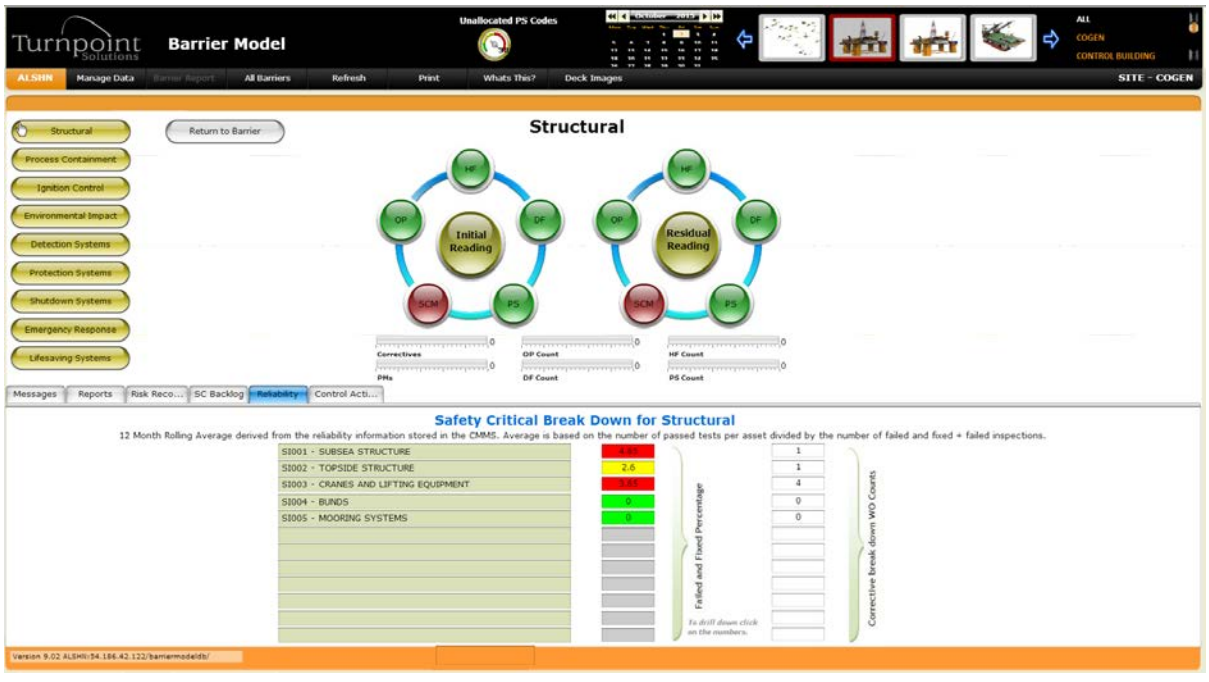
The structure of the barrier model remains the same for each region – re-using the same data analytic and same dashboard encapsulating business rules and presenting consistently across the installation.

Functional Impact on the barrier Model

The CMMS integration affects the barrier model in the following way

- SCM node on the barrier model will now automatically populate with data from CMMS based on consistent rules. This includes all the business logic associated to PS Code assignment. The barrier is affected by the SCM node based on the safety critical elements (SCE) which are listed separately broken down by emergency work, PM and CM work in backlog which is Safety Critical and with a PS Code assigned. The SCM node will only influence a barrier to an AMBER state.

- Reliability Tab will now be based on the CMMS work order information known as the failure condition, and the number of failed and fixed ratios will be calculated. Over a 12 month period, the barrier model will sum all the Amber Failed and Fixed, and Red Failed and divide by the Amber Failed and Fixed, Red Failed and Green Pass. In addition it will display the number of corrective break downs in the 12 month period.
-



- Reports. There are a number of reports within the barrier model which are affected by the CMMS integration. These include the PS Code allocation Report, Reliability Drill Down Report and the SC Backlog Drill Down Report.

SC Backlog Drill Down Report. The report will be updated by Business Objects and available from the Barrier Model as a PDF report.

Site Code: COGEN

Work Order Drill Down by Site and Barrier Code

Monday, September 28, 2015

Performance Standard	1 - Emergency	2 - Preventative	3 - Corrective	Total
DS001 - FIRE AND GAS DETECTION SYSTEMS	0	0	1	1
ER002 - ESCAPE AND EVACUATION	1	0	1	2
ER004 - UNINTERRUPTED POWER SUPPLY (UPS) AND EMERGENCY POWER	0	4	0	4
IC003 - IGNITION PREVENTION (EX EQUIPMENT)	0	2	0	2
PC001 - PRESSURE VESSEL, HEAT EXCHANGERS	0	9	1	10
PC005 - RELIEF SYSTEMS	0	24	0	24
PC008 - PIPING INC SMALL-BORE TUBING AND FLEXIBLE HOSE	3	0	2	5
PS002 - STRUCT ELEMENTS PROVIDING F AND E PROTECTION	0	1	0	1
PS003 - FOAM SYSTEMS	0	1	0	1
PS004 - FIREWATER PUMPS	0	11	0	11
PS005 - FIREWATER RING MAIN	0	2	0	2
SD001 - EMERGENCY SHUTDOWN	0	17	1	18
SI005 - MOORING SYSTEMS	1	0	0	1

Performance Standard	Barrier Level	Work Order	Work Order Description	Safety Critical	Area Code	Area Code	Asset No	LFD	Job Plan No	Priority	P1 to 3 Backlog Indicator
DS001 - FIRE AND GAS DETECTION SYSTEMS	3 - Corrective	WA-0467105	Renew both flame sight glasses on H-0501 enclosure (SD Job)	SAFETY CRITICAL		CORRECTIVE	46989	22 Feb 2014			N

Performance Standard	Barrier Level	Work Order	Work Order Description	Safety Critical	Area Code	Area Code	Asset No	LFD	Job Plan No	Priority	P1 to 3 Backlog Indicator
ER002 - ESCAPE AND EVACUATION	1 - Emergency	WO32311	TEST OF SSSV CONTROL CIRCUIT USING FIRE SIGNAL	SAFETY CRITICAL	UTILITIES	CORRECTIVE	37TSH130	21 Oct 2013		1	N
	3 - Corrective	WA-0437590	P-0710B Replace insulation lagging	SAFETY CRITICAL		CORRECTIVE	55021	28 Sep 2014			N

Performance Standard	Barrier Level	Work Order	Work Order Description	Safety Critical	Area Code	Area Code	Asset No	LFD	Job Plan No	Priority	P1 to 3 Backlog Indicator
ER004 - UNINTERRUPTED POWER SUPPLY (UPS) AND EMERGENCY POWER	2 - Preventative	WA-1121405	PM ROUTE: THERMOGRAPHIC SURVEY, AMINE CO2 REMOVAL SYSTEM (CONMON)	SAFETY CRITICAL		PREVENTATIVE		29 Sep 2014	E029-SC		N
		WA-1121483	PM ROUTE: THERMOGRAPHIC SURVEY, GLYCOL SYSTEM (CONMON)	SAFETY CRITICAL		PREVENTATIVE		29 Sep 2014	E029-SC		N
		WA-1124475	PM ROUTE: THERMOGRAPHIC SURVEY, MOL SIEVE DEHYDRATION / REGENERATION GAS (CONMON)	SAFETY CRITICAL		PREVENTATIVE		14 Oct 2014	E029-SC		N
		WA-1125114	PM ROUTE: THERMOGRAPHIC SURVEY, FUEL GAS SYSTEM (CONMON)	SAFETY CRITICAL		PREVENTATIVE		15 Oct 2014	E029-SC		N

PS Code Allocation Report. The report will be updated by Business Objects and available from the Barrier Model as a PDF report.

Reliability Drill Down Report. The report will be updated by Business Objects and available from the Barrier Model as a PDF report based on the Failed and Fixed ratios displayed on the barrier model as at the current week.

Site Code: COGEN
From: 9/28/2014
To: 9/28/2015

Reliability Breakdown 12 Month Consolidation

9/28/2015

Barrier	PS Code	Owner	Green Pass	Amber FailFix	Red Fail	Percent FF	Percent FF
SI Structural	SI001 - SUBSEA STRUCTURE	Structural	98	4	1	5.00%	1
	SI002 - TOPSIDE STRUCTURE	Structural	77	1	1	3.00%	1
	SI003 - CRANES AND LIFTING EQUIPMENT	Cranes and Lifting Equipment	166	2	4	3.00%	4
		Total:	341	7	6	3.67%	6
PC Process Containment	PC001 - PRESSURE VESSEL, HEAT EXCHANGERS	Pressure Systems	4	0	0	0.00%	4
	PC002 - ROTATING EQUIPMENT	Rotating Equipment	14	0	0	0.00%	0
	PC003 - TANKS	Pressure Systems	0	0	0	0.00%	1
	PC005 - RELIEF SYSTEMS	Process & Production Chemistry	1	0	0	0.00%	0
	PC008 - PIPING INC SMALL-BORE TUBING AND FLEXIBLE HOSE	Pressure Systems	0	0	0	0.00%	29
	No PS Code		70	0	0	0.00%	0
		Total:	89	0	0	0.00%	34
IC Ignition Control	IC002 - NON HAZARDOUS AREA VENTILATION	HVAC	141	0	0	0.00%	0
	IC003 - IGNITION PREVENTION (EX EQUIPMENT)	Electrical	1	0	0	0.00%	4
	TE001 - TEMPORARY EQUIPMENT		2	0	0	0.00%	0
	No PS Code		17	0	0	0.00%	0
		Total:	161	0	0	0.00%	4
DS Detection Systems	DS001 - FIRE AND GAS DETECTION SYSTEMS	Control & Instrumentation	49	2	0	4.00%	0
		Total:	49	2	0	4.00%	0
PS Protection Systems	PS001 - DELUGE SYSTEM	Technical Safety	23	0	0	0.00%	0
	PS002 - STRUCT ELEMENTS PROVIDING F AND E PROTECTION	Structural	2	0	0	0.00%	0
	PS003 - FOAM SYSTEMS	Technical Safety	6	0	0	0.00%	0
	PS004 - FIREWATER PUMPS	Technical Safety	39	0	0	0.00%	0
	PS005 - FIREWATER RING MAIN	Pressure Systems	3	0	0	0.00%	0
	PS007 - NITROGEN BLANKET	Technical Safety	10	0	0	0.00%	0
	PS009 - DRY POWDER SYSTEM	Technical Safety	0	0	1	100.00%	0

Business Assumptions

1. The collection logic for each CMMS region will be the same as the other regions
2. Collection of the CMMS information will be once per day.
3. The performance codes are the same for all regions. If there is a difference, then a mapping must be made available from the business and this logic will be added into the logical tier in the collection process.
4. The automatic feed will now influence the percentage accuracy score. If there are Safety Critical work order records in backlog which have PS codes which are not assigned, then these are noted in the exception report. There is an expectation that for some work orders there will be a need to either update the work order in CMMS or provide the performance codes code assignment inside the barrier model.
5. When analysing the reliability measure, there are 3 categories of failure consequence that a work order is scored. Green – Fully meets performance standard, Amber – Fails to meet performance standard but remedied on site, and Red – Fails to meet performance standard. There is an assumption that these are stored in CMMS against the work order.
6. Filter on date range – Based on RCM data sliced on a Sunday – Weekly measure.

Platform	Barrier	Performance Standard	Green (Pass)	Amber (FF)	Red (F)	Total number of checks	% of FF + F over total checks
SITECODE							
	01-SI	SI001	40	3	1	44	9%
		SI002					
	02-PC	PC001					
		PC002					

RAG influence of CMMS integration

A barrier colour is built up using cumulative information identified as nodes. This means that multiple data aggregations contribute to the weight of the measure which is then translated into a colour indicator.

SCM Node calculation

SCM Count = Number of CM Work orders (Corrective Open Work orders that are safety critical)
+
Number of PM Work orders (Preventative Open Work orders that are safety critical)
+
Number of CM SC work orders that are Priority 1 to 3 (The CM count separates out the P1-3 work orders so they are not counted twice)

P1-3 Backlog = Number of Open work orders that are CM or PM and safety critical with a priority of 1-3 and in backlog (Current date is past the latest finish date)

CM P1-3 Backlog > 1
CM P1-3 Failure =>5
OR PM/CM Count > 10
} Colour is Red

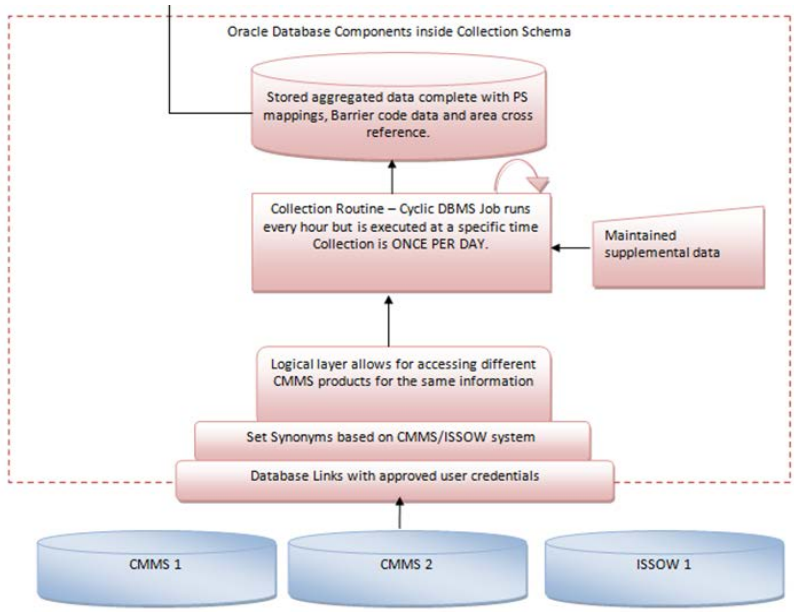
CM P1-3 Failure =>1<5
PM/CM Count =>5 <10
} Colour is Amber

CM P1-3 Failure = 0
OR CM/PM Count < 5
} Colour is Green

Information Flow

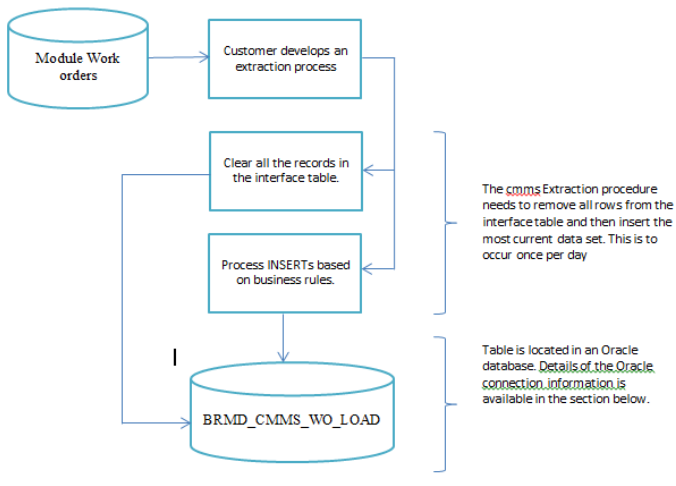
Barrier Model is required to gather work order information once per day and stores this information into a temporary holding table. This allows the system to gather work management information from multiple sources. During the original implementations of the barrier model, there were 3 different integrations into the barrier model for one region as each asset had different systems.

As the barrier model only gathers information once per day, its own structure is tiered. There is a simple business layer that resides in the barrier model which separates the remote system data. This structure is supported by Oracle database views which gather information from the different instances of CMMS and pull data into the barrier model holding tables.



The expectation is that the cmms team can code an extraction of relevant work order information with the following business rules

- Only select work orders that are Safety Critical
- Only select work orders that are either
    - OPEN (so not PCOMP etc) with a HIGH priority
    - BASCKLOG work orders. i.e. work that has passed its latest finish date based on the SYSTEM date.
- Only select work orders that have an order type of Corrective Work, or Preventative Work.



Data Services – Work Order Feed

The dashboard data analytic is designed to gather from each connected instance of CMMS and extract the following information based on the region and site codes. The following table shows each field.

Please note that interface table described below will contain raw data sent from the CMMS maintenance system. There is a transformation process that will take place during the uploading of this information into the barrier mode. This transformation layer will align the data properties to a common data set.

The destination is the staging tables held in the barrier model (BRMD_CMMS_WO_LOAD). There is also a WEB services method available as well as a direct TABLE insert method. Both have the same data elements noted in the table. Details of the web services/ load tables are provided during commission phase.

The collection process gathers this information once per day looking up the information in the interface table and processing it each day.

BRMD_CMMS_WO_LOAD		
Field Name	**Description**	**Field Type**
LOAD_DATE	Date on which the data load occurs.	DATE
WORK_ORDER	Work Order Number which for PMs and CMs is a unique number.	VARCHAR2(30)
WO_DESC	Work Order Description	VARCHAR2(255)
PRIORITY	Work Order Priority Values expected are 1-Emergency 2-Urgent 3-Planned The values will be translated to 1, 2 or 3 during the load to the barrier model Additional transformation will be that if the backlog is Yes and this is a high priority work order (SAP value is 1), then the flag in the field P1TO3_BKLOG_IND must be set to “Y” If the work order is a high priority (SAP value is 1) – but is not in backlog then field P1TO3_OPEN_IND must be set to “Y”	VARCHAR2(55)
LATEST_FINISH	The latest finish date the work order must be complete. For Backlog indication, if this date is past the SYSDATE, the work order will be considered in BACKLOG. If the date is on or before the SYSDATE the work order will be considered OPEN.	DATE

MAINTENANCE_TYPE	Will indicate if the work order is Preventative or corrective. Expect values in this column to be PM or CM	VARCHAR2(10)
COMPANY_CODE	Company code relates to the region.	VARCHAR2(10)
FUNCTIONAL_LOCATION	Functional Location. This code will be used as the asset number, location of the asset, and to determine the Barrier Model site code. The site code can be translated from this code.	VARCHAR2(255)
FUNCTIONAL_LOCATION_DESC	Description of the functional location	VARCHAR2(255)
MAIN_WORK_CENTRE	Work centre.	VARCHAR2(55)
SYSTEM_STATUS	System Status – this is to distinguish between approved and not approved work orders. Only approved work orders will be selected into the barrier model.	VARCHAR2(255)
MAINT_ACTIVITY_TYPE	Indicates that the work order is Safety Critical. SC	VARCHAR2(10)
PS_CODE	These maps to the performance standard of the asset which the work order relates to. If regulation details are not available in the work management system, this field is BLANK. In this case the work order will appear on the PS Code Assignment window and a user will have to manually assign the Barrier and PS code. If the work order is a PM, then the mapping is at a lower level and the PS code is still BLANK – See JOB_PLAN_NO for further details.	VARCHAR2(25)
AREA_CODE	**Will be blank.** Option for future, this field can be mapped to one of the 10 logical area codes for a site. Area codes are manually set up inside the application and can be established at any stage.	VARCHAR2(200)
JOB_PLAN_NO	The original maintenance plan for a PM record only. This field will be blank for CM records. This value is used to map PS codes automatically using the PS CODE ASSIGNMENT Routine inside the application. For example if the Job plan number is entered into the assignment window, each time a work order is pushed over, it will use the same PS Code assignment for mapping to the barrier model.	VARCHAR2(15)
P1TO3_OPEN_IND	Indicates if the work order is a high priority but is not in backlog. “Y” or “N” value. Will set the node to RED and the barrier to AMBER if this is set to Y and there are more than 2 records for the same barrier	VARCHAR2(1)

P1TO3_BKLOG_IND	Indicates if the work order is in backlog and high priority. "Y" or "N" value. Will set the node to RED and the barrier to AMBER if this is set to Y and there are more than 1 records for the same barrier.	VARCHAR2(1)

Data Services – RCM Analysis (Not mandatory)

The dashboard data analytic is designed to gather RCM information from each connected instance of CMMS and extract the following information based on the region and site codes. The following loading table shows each field and its CMMS source which contains schema and table name and column dot notation however note that the respective DB links dependant on the CMMS instance).

The destination is the staging tables held in the barrier model (BRMD_CMMS_RELIABILITY_LOAD).

BRMD_CMMS_RELIABILITY_LOAD		
Field Name	**Description**	**Field Type**
SITE CODE	Relates to the SITEID set up in CMMS. There is a mapping table in the barrier model which allows the CMS site ID to map to the associated Barrier mode site code.	VARCHAR2(55)
STATUSDATE	The last date change of a work order status code.	DATE
BARRIER	The associated barrier for the work order is based on the regulation tab. The performance standard allocated to the work order. Must be SI, PC, IC, DS, PS, SD, ER, LS, EI	VARCHAR2(10)
PS_CODE	The performance standard allocated to the work order. The definitive list is unique to a region. EG PS001, EI001. The integration will look up any existing PS Code assignments based on the work order interface and assign them to this feed. This field can therefore be left blank, but the integration will only be able to count the record with a PS code assignment.	VARCHAR2(25)
WORK ORDER	Work order data is required such as the entry date, description, work group, department and work type.	VARCHAR2(30)
WORK DESC	Work order description is based on the work order description.	VARCHAR2(150)
PEAR_DESC	PEAR description is the justification of work order.	VARCHAR2(150)
MAINT_TYPE	Will indicate if the work order is Preventative or corrective. PM or CM depending on the value held in the PMNUM field.	VARCHAR2(12)
LATEST FINISH DATE (LFD)	The latest finish date the work order must be complete.	DATE
PRIORITY	Work Order Priority Values expected are 1-Emergency 2-Urgent 3-Planned	VARCHAR2(55)
JOBPLAN	Associated PM job plan number	VARCHAR2(15)

GREEN_PASS	Based on the failure consequence information in CMMS	NUMBER
AMBER_FAILIFX	Based on the failure consequence information in CMMS	NUMBER
RED_FAIL	Based on the failure consequence information in CMMS	NUMBER
CM_FAILED	Based on the failure consequence information in CMMS	NUMBER

Data Services – ASSETS

The dashboard data analytic is designed to gather from each connected instance of CMMS and extract the following information based on the region and site codes.

The destination is a reference table which the barrier model application uses to identify assets components and their associated performance standard (BRMD_CMMS_MASTER_ASSET_LOAD).

BRMD_CMMS_MASTER_ASSET_LOAD		
Field Name	**Description**	**Field Type**
SITE CODE	Relates to the SITEID set up in CMMS. There is a mapping table in the barrier model which allows the CMS site ID to map to the associated Barrier mode site code.	VARCHAR2(55)
ASSET_NO	The unique indentify of an asset record	VARCHAR2(55)
LOCATION	The unique indentify of an asset record	VARCHAR2(255)
SYSTEM_NAME	Refers to the PS associated to the asset	VARCHAR2(255)
ASSET_NAME	Name of the asset tag (subSTR255)	VARCHAR2(255)
PI_ELEMENT	Name of associated PI/DCS element reference – which will be located in the Web Method call from the PI/DCS system to the barrier model for primary mitigation monitoring. (OPTIONAL)	VARCHAR2(255)

End of Document