# COMMONWEALTH OF PENNSYLVANIA

# HEALTH & HUMAN SERVICES DELIVERY CENTER

# INFORMATION TECHNOLOGY STANDARD

|  |  |
| --- | --- |
| Name of Standard: **MS SQL Server** | Number: |
| **2014 / 2016 / 2019 Naming and Coding Standard** | **STD-DMS009** |
| Domain:  | Category: |
| **Data** |  |
| Date Issued: | Issued by Direction of: |
|  |  |
| Date Revised: |  |
| **6/05/2020** | **Jon Arnold, Chief Technology Officer, Health & Human Services Delivery Center** |

**Abstract:**

The purpose of this document is to detail and give examples of Microsoft Structured Query Language (MS SQL) development standards followed at the Health and Human Services Delivery Center (HHS DC) supporting the Departments of Human Services (DHS), Aging (PDA) and Military and Veterans Affairs (DMVA).

**General:**

Coding standards are conventions and methods developers follow when developing, editing or maintaining program code. Better programming style, developer understanding, readability and reduced application development time are the results of following coding standards.

**Database Modeling Environment**

ERwin Data Modeler is the standard tool for designing and modeling SQL Server 2014/2016/2019 databases.

All models are reviewed by the SQL Server Database teams in HHS Technology Services Office (TSO) Service Operations and Service Delivery.

All completed models are stored in the Microsoft Visual Studio Team Foundation Server.

**Database Data Definition Environment**

Microsoft SQL Server Management Studio is the standard tool to use for the execution and modification of Data Definition Language (DDL) for the development of SQL Server 2014/2016/2019 databases. The general process is:

1. Initially generate a DDL from ERwin using forward engineering, or if required, create DDL statements manually within SQL Server Management Studio.
2. Execute the DDL within SQL Server Management Studio and, if necessary, edit and/or tune the statements using the Management Studio environment.
3. Reverse engineer the database back into ERwin to keep the database and data model synchronized.

Store revised data models and all DDL scripts in Microsoft Visual Studio Team Foundation Server. Store the DDL scripts in a consistent manner under the project folder in Team Foundation Server.

**Database Programming Environment**

Use SQL Server 2018 Management Studio to code and test stored procedures and triggers.

Prototype every process using Transact-SQL (T-SQL) within SQL Server Management Studio prior to creating a new stored procedure, view, function or trigger. This results in ease of debugging.

Use Execution Plans

 Estimated Execution plans need to be used while developing T-SQL.

 Actual Execution plans need to be included in the migration packet.

Use Database Engine Tuning Advisor

SQL Server DBA’s and analysts use this tool to determine if additional keys or indexes may be required. Creation of the additional objects are determined and executed by database administrators and analysts.

**General Import/Export File Rules**

All files imported to and exported from SQL Server 2014/2016/2019 preferred delimited. Although commas, hyphens, semicolons and other characters can be used to delimit files, **only a vertical bar (| or ‘pipe’) is allowed, no exceptions**. Using other characters introduces the possibility of that character being embedded as valid data within a text or large variable character column. A vertical bar is less likely to be valid data.

**Commenting Guidelines**

These rules apply in general to all source files.

Object Header Usage

Include object headers in every source code file.

Object Maintenance Documentation

Include object maintenance documentation in every source code file. Keep this documentation current on all revisions after moving any given source file into production. Before initial migration into production, revision information is not required.

Comment Quality

Comments must contain a description of the process the SQL module (source file), procedure, or trigger accomplishes. Write the description in clear, concise, non-colloquial English, using business terms to describe the processes.

Do not use comments such as:

--

-- Declare the Customer Name Variable

--

DECLARE @CustomerName AS VARCHAR(32)

Describe the purpose of the process and how it works, in non-technical terms. This is important because most developers can read the SQL and see line-by-line what it does mechanically, but may not be able to easily grasp the purpose (business logic) behind the code. Write comments to aid the reader of the code. Assume that the reader is not well versed in Transact-SQL and try always to describe the “how” and “why” of the process clearly.

**Comment Quantity**

More comments are better than using fewer comments. Remember that the code is reviewed first, then, over time (perhaps after many years), require revisions and enhancements. Providing adequate comments allows the database administrator, developer, and the developer’s peers to quickly understand the logic and perform necessary revisions, and so forth.

**Standard Object Header**

Every object contains an object header. An object header contains the database name, object name, creation date, author, a brief description of the object, parameters passed, returns, calling mechanism, tables and aliases used in code, other procedures called, DPSR #, notes, and any special comments and warnings. Module headers remain open on the right-hand side.

**Documentation for Object Maintenance**

This section describes how to document changes in the Transact-SQL source code. The method involves using a maintenance documentation heading and comments within the source code. A common developer signature provides these together.

Object Maintenance Documentation

Immediately following the object header there is a skeletal maintenance block. Use this skeletal block as a template for maintenance done to the object code. Copy, paste, and fill in this block when you alter the object code. The block copy marks are on the lines with the equal signs. Include the lines with the block copy marks.

Make the insertion of the copied block directly after the skeleton block. Thus, the history is recorded from earliest to latest.

**Example of OBJECT HEADER AND MAINTENANCE DOCUMENTATION**

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\* DATABASE: OMAPINTERNET

\* PROCEDURE NAME: usp\_SelectAllResults

\* DATE: 04/03/2009

\* AUTHOR: Homer Simpson

\* PROCEDURE DESC: This proc returns all the results for a specific NDC,

\* ShortName or market basket code or their combination

\* WorkOrder# 13798

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

\* DATE: Developer Change

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 08/01/2013 Joe Developer Add Indicator

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*/

Minor Line-level Commenting

Do not put comments on the same line as the code. Examples of this illegal style follow:

DECLARE @IsNew AS Integer -– Is New Flag

DECLARE @Firstname AS VARCHAR(32) -- First Name Field

Insert all comments for a particular section of code before the code block, with one blank comment line before and after the comment. An example follows:

--

-- Declare the local working variables

--

DECLARE @IsNew AS Integer

DECLARE @Firstname AS VARCHAR(32)

--

-- Return identity value.

--

SET @IDENTITY\_CONTACT = CAST(SCOPE\_IDENTITY() AS INT)

 SELECT @IDENTITY\_CONTACT

**Formatting Guidelines**

**Font Style, Size, and Capitalization**

Font Style and Size

Write all SQL code in 10 point Courier New font.

Capitalization

Please make sure that Transact-SQL keywords are opposite case from variables, field names, and object names when coding SQL statements,.

Tab Stops

Set tabs to either four spaces or eight spaces (default).

Line Length

Do not write a Transact-SQL line that exceeds 132 characters in length, unless there is no other way to properly format the source.

Line Count—needs moved to store proc section.

Do not write procedures that exceed four pages in length excluding comments, headers, and maintenance log, without written justification to the data base administrators. Exceptions to rule are procedures used in conversion or loads of data. Code exceeding this limit should be looked at closer and possibly split into smaller stored procedures or modularized.

Star “\*” Usage

Do not use the star symbol “\*” in a Transact-SQL statement, as this is very inefficient.

This is prohibited .In all instances, include the appropriate fields in the statements where needed. An example of the wrong way to write a Transact-SQL statement follows:

SELECT \*

FROM T\_VENDOR

If you must return a count, select one field in the table or use 1. Example below.

Select count (1)

from T\_VENDOR

Examples of the right way to write a Transact-SQL statement follows. Specify each field as in the examples:

SELECT Field1,

 Field2,

 Field3,

 Field4

FROM TABLE\_A

WHERE nbr\_vt = @nbr\_vt\_recent

SELECT PMT.IDN\_APPLN\_PMT,

 PMT.AMT\_BNFT

FROM T\_APPLN\_PMT PMT

INNER JOIN T\_VOU\_TRNSMTL VT

 ON VT.IDN\_TRNSMTL\_VOU = PMT.IDN\_TRNSMTL\_VOU

Compound Statements

Compound statements are those that are encased within a **BEGIN**…**END** structure. Formatting rules for this structure are as follows:

1. The **BEGIN** statement aligns directly under the statement above.
2. The **END** statement is aligned in the same position as its corresponding **BEGIN** statement.
3. Within the **BEGIN**…**END** structure, statements are indented and should be in alignment.

IF…ELSE Statement Blocking

Treat all “**IF**” statements (and block “ifs”) as if they were compound statements using the **BEGIN**…**END** structure. No exceptions are permitted.

An example follows:

IF @@ROWCOUNT < 1

BEGIN

 RETURN -1

END

ELSE

BEGIN

 SELECT @RowReturned = @@ROWCOUNT

 RETURN 0

END

Multi-line Parameter Style

When you must expand a statement to more than one line (because it exceeds the 80-character line limit standard), use the style in the following example, for consistent readability. It is best to apply this style even when you do not exceed the 80-character limit (though this rule is not strictly enforced).

EXECUTE usp\_MyStoredProcedure

 @MyParameter1,

 @MyParameter2,

 @MyParameter3 OUTPUT,

 @MyParameter4 OUTPUT

Indenting and Formatting SQL Statements

The styling presented in this standard provides for a more consistent look to all stored procedures and triggers. The guidelines presented here (by example) apply to all Transact-SQL statements. Use of white space is highly recommended.

Example of Select Statement

SELECT DISTINCT t1.nbr\_rcpt,

 t2.nam\_rcpt

FROM T\_TABLE1 t1,

 T\_TABLE2 t2

WHERE t1.nbr\_value = t2.nbr\_value

 AND t1.cde\_value = @ParmKeyVal

 AND (t1.nbr\_value < 1 OR t1.nbr\_value > 99)

ORDER BY t2.nam\_rcpt DESC

From the example, it can be seen that:

1. Individual elements are placed in separate lines
2. Elements are indented one tab stop
3. Keywords are to the left whenever possible
4. If the length of the keyword or keywords (ex: “**SELECT DISTINCT**” and “**ORDER BY**”) equals or exceeds the tab stop setting (8), the parameter is placed on the subsequent line at the proper indent position
5. Parentheses are used to distinguish logical blocks and are indented at the same level as any other parameter.

**Other examples follow:**

Example of Select Statement:

SELECT DISTINCT t1.nbr\_rcpt,

 t2.nam\_rcpt

FROM T\_TABLE1 t1,T\_TABLE2 t2

WHERE t1.cde\_value = t2.cde\_value

 AND t1.nbr\_rcpt = @ParmKeyVal

 AND (t1.cde\_value < 1 OR t1.cde\_value > 99)

ORDER BY t2.nam\_rcpt DESC

Examples of Insert Statements

INSERT

INTO T\_VENDOR

(

 nam\_vendor,

 cde\_active,

 dte\_crtd,

 idn\_user\_crtd

)

VALUES

(

 @Name,

 @Active,

 GETDATE(),

 @ModifiedUser

)

Example of Update Statement

UPDATE T\_VENDOR

 SET nam\_vendor = @Name,

 cde\_active = @Active,

 dte\_crtd = GETDATE(),

 idn\_user\_crtd = @ModifiedUser

 WHERE nbr\_vendor = @VendorID

Example of Delete Statement

DELETE

FROM T\_VENDOR

WHERE nbr\_vendor = @VendorID

 Example of Case Statement

 CASE @myfield

 WHEN 'A' THEN 'ABC '

 WHEN 'B' THEN 'BCD '

 WHEN 'C' THEN 'CDE '

 ELSE 'JKL'

 END

**Naming Conventions**

For table and column names please reference the Data Administration Standards on the Data Domain page under Business and Technical Standards on the [BIS web site](http://mydhs/oa/bis/index.htm).

Table Naming

All table names follow the current BIS naming conventions and are prefaced with a T\_.

 Example: T\_FIPS\_CODE

Column Naming

All column names follow the current DHS naming conventions.

View Naming

All view names consist of the prefix VW\_ followed by business function they perform or business rule they enforce.

 Example: VW\_SEL\_T\_FIPS\_CODE

Variable Formats

All variable names are defined in a consistent manner across all the programs. To ensure consistency parameters are descriptive and define correctly according to their usage.

 @p\_IDN\_RECON integer,

@p\_IDN\_ALJ integer,

@p\_HONORABLE varchar(20)= NULL,

Parameters can be set to NULL.

Instead of using an IF block to check for NULL parameters, NULLS are checked like the example below. Second example is to check a range.

(B.CDE\_PARTY\_RQNG = @p\_CDE\_PARTY\_RQNG OR @p\_CDE\_PARTY\_RQNG IS NULL)

 ((DTE\_FAA\_BHA >= @p\_DTE\_FAA\_BHA\_FROM AND DTE\_FAA\_BHA <= @p\_DTE\_FAA\_BHA\_TO)

 OR (@p\_DTE\_FAA\_BHA\_FROM Is NUll AND @p\_DTE\_FAA\_BHA\_TO Is NUll))

If you have to use a dynamic order by (sort results) pass in the field to sort and the sort order.

@p\_field\_order\_sort varchar(50)=null,

@p\_order\_sort varchar(4)=null

IF @p\_order\_sort = 'ASC'

 BEGIN

 SELECT m.ProviderName as NAM\_PROVR,

 m.NAM\_BUSNS\_MP,

 m.NAM\_PROVR\_ALT,

 FROM tblMedicheck m

 WHERE m.Providername = @p\_nam\_provr

 ORDER BY

 CASE @p\_field\_order\_sort

 WHEN 'NAM\_PROVR' THEN m.ProviderName

 WHEN 'NAM\_BUSNS\_MP' THEN m.NAM\_BUSNS\_MP

 WHEN 'NAM\_PROVR\_ALT' THEN NAM\_PROVR\_ALT

 END

 ASC;

 END

 ELSE

 BEGIN

 SELECT m.ProviderName as NAM\_PROVR,

 m.NAM\_BUSNS\_MP,

 m.NAM\_PROVR\_ALT,

 FROM tblMedicheck m

 WHERE m.Providername = @p\_nam\_provr

 ORDER BY

 CASE @p\_field\_order\_sort

 WHEN 'NAM\_PROVR' THEN m.ProviderName

 WHEN 'NAM\_BUSNS\_MP' THEN m.NAM\_BUSNS\_MP

 WHEN 'NAM\_PROVR\_ALT' THEN NAM\_PROVR\_ALT

 END

 DESC;

 END

Stored Procedures

When coding enterprise applications, the use of stored procedures to separate application logic from database code has been found beneficial. Stored procedures are used for any data access (SELECT) or manipulation (INSERT, DELETE, UPDATE).

The advantages include:

* Ease of Maintenance – When supporting database structure or application logic changes, the DML is easily accessible directly from the database, can be easily scanned using SQL, and eliminates the need to interrogate each COM or .NET object when searching for a particular database reference. As such, it is recommended that all web-based applications use stored procedures for the majority, if not all, database access.
* Enhanced Performance – Stored procedures run directly on the database server, which is optimally tuned to perform such operations.
* Reusability – Stored procedures can be called from multiple applications, thereby reducing the time required to design, code and test commonly used application functions.

Stored procedures are named according to the business function they perform or business rule they enforce. The name should include a prefix of USP and a business description of the action performed. The name is appropriately abbreviated with items found in the standard abbreviation list. An example of a procedure name is USP\_ADD\_NEW\_T\_INDIV. As the name implies, this procedure adds a new row to the T\_INDIV table.

All stored procedures, begin with one of the following:

USP\_SELECT

USP\_UPDATE

USP\_INSERT

USP\_DELETE

Stored Procedures performs only one function. This means one insert, one update or one delete statement per stored procedure. An “if” clause determining whether an insert or update should be performed, is acceptable. See the DBA team if there are any questions.

Multiple update\delete\insert statements can cause locking\blocking, orphan records and unhandled transactions.

Do not write store procedures that exceed four pages in length excluding comments, headers, and maintenance log, without written justification to the data base administrators. Exceptions to the rule are procedures used in conversion or loads of data. Analyze code exceeding this limit and split into smaller stored procedures or modularize.

For a SELECT, items in yellow are standard. The comment block is simple and contains a brief audit listing of changes that go to production; not a running summary of changes during development. Error Trapping is highly recommended with the Enterprise libraries, because if you have an error, the first thing we ask is what the error log says. Please also list the fields. No SELECT \* is allowed. Also, white space for readability is also highly desirable.

Example

USE [RECON]

GO

/\*\*\*\*\*\* Object: StoredProcedure [RECONSchema].[USP\_SELECT\_BACK\_END\_RECON] Script Date: 09/10/2015 09:23:38 \*\*\*\*\*\*/

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

-- Author: George Washington

-- Create date: 07/04/2012

-- Description: get all fields for the Back End Screen from the RECON table

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

DATE: Developer Change

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01/05/2012 George Washington New

03/25/2013 Tom Jefferson Added DTE\_CLER\_RTND

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ALTER PROCEDURE [RECONSchema].[USP\_SELECT\_BACK\_END\_RECON]

 (

 @IDN\_RECONS Integer

 )

AS

BEGIN

 SET NOCOUNT ON;

 BEGIN TRY

SELECT [IDN\_RECONS]

 ,[TXT\_CASE\_NUM]

 ,[TXT\_APPEAL\_NUM]

 ,[TXT\_BHA\_FILE\_NUM]

 ,[DTE\_RCVD\_BHA]

 ,[DTE\_MLNG\_ORDER\_FINAL\_SCTRY]

 ,[DTE\_CREATN]

 ,[NAM\_BY\_CRTD]

 ,[DTE\_MODFD]

 ,[NAM\_BY\_MODFD]

 FROM [RECON].[dbo].[T\_RECON]

 where IDN\_RECONS = @IDN\_RECONS

 END TRY

 BEGIN CATCH

 SELECT

 ERROR\_NUMBER() AS ErrorNumber,

 ERROR\_SEVERITY() AS ErrorSeverity,

 ERROR\_STATE() AS ErrorState,

 ERROR\_PROCEDURE() AS ErrorProcedure,

 ERROR\_LINE() AS ErrorLine,

 ERROR\_MESSAGE() AS ErrorMessage;

 END CATCH

END

For an UPDATE, items in yellow are standard. The comment block is simple and contains a brief audit listing of changes that go to production; not a running summary of changes during development. Error Trapping is highly recommended with the Enterprise libraries, because if you have an error, the first question is what the error log says. Please also list the fields. No SELECT \* is allowed. Also, white space for readability is also highly desirable.

Example

USE [StateFacilityTrackingSystem]

GO

/\*\*\*\*\*\* Object: StoredProcedure [PTS].[USP\_UPDATE\_BSU] Script Date: 09/10/2015 09:52:53 \*\*\*\*\*\*/

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Database: StateFacilityTrackingSystem

Procedure Name: USP\_UPDATE\_BSU

Date: 10/21/2014

Author: Harry Potter

Procedure Desc: This procedure creates new bsu for existing admission.

Parameters: see below

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

DATE: Developer Change

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02/02/2014 PETER PAN New

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ALTER PROCEDURE [PTS].[USP\_UPDATE\_BSU]

@IDN\_PTN\_ADMSN AS INT=0,

@IDN\_BSU AS INT,

@PNT\_BSU\_CODE AS VARCHAR(7),

@PNT\_BSU\_NUMBER AS VARCHAR(7),

@PNT\_BSU\_EFF\_DTE AS DATETIME,

@CWOPA\_ID AS VARCHAR(12)=NULL

AS

SET NOCOUNT ON;

BEGIN TRY

UPDATE PTS.T\_PNT\_BSU

SET CDE\_BSU=@PNT\_BSU\_CODE,

 DTE\_EFFV\_BSU=@PNT\_BSU\_EFF\_DTE,

 NBR\_CASE\_BSU=@PNT\_BSU\_NUMBER,

 DTE\_UPDTD\_RECORD=GETDATE(),

 IDN\_USER\_UPDTD\_RECORD=@CWOPA\_ID

WHERE IDN\_BSU\_PNT=@IDN\_BSU

 END TRY

 BEGIN CATCH

 SELECT

 ERROR\_NUMBER() AS ErrorNumber,

 ERROR\_SEVERITY() AS ErrorSeverity,

 ERROR\_STATE() AS ErrorState,

 ERROR\_PROCEDURE() AS ErrorProcedure,

 ERROR\_LINE() AS ErrorLine,

 ERROR\_MESSAGE() AS ErrorMessage;

 END CATCH

An INSERT/UPDATE is also acceptable as long as you are doing either an INSERT or an UPDATE – not both! This is acceptable:

IF @P\_IDN\_USER = ‘cwopa\user’

 BEGIN

 UPDATE PIOS.dbo.T\_CW\_ASGMT

 SET IDN\_CW = @P\_IDN\_CW,

 DTE\_ASGMT\_CASE = @P\_DTE\_ASGMT\_CASE,

 IDN\_USER\_CHANGE\_LAST = @P\_IDN\_USER,

 DTE\_RECORD\_CHANGE\_LAST = GetDate()

 WHERE IDN\_ASGMT\_CW = @P\_IDN\_ASGMT\_CW

 END

ELSE

 BEGIN

 INSERT INTO PIOS.dbo.T\_CW\_ASGMT

 (IDN\_CW

 ,IDN\_STATUS

 ,DTE\_CHANGE\_STATUS)

 VALUES

 (@P\_IDN\_CW

 ,@P\_IDN\_STATUS

 ,NULL)

 END

**THIS IS NOT ACCEPTABLE:** An Insert or UPDATE stored procedure performs one UPDATE or INSERT, and rarely more than that. Check parameters in your .NET code and then an INSERT or UPDATE is called.

A Transaction can be set in the .NET code to either commit all INSERTS or none of them if the code has multiple INSERTS/UPDATES.

In this case a collection in .NET can be used and the same INSERT could be called as many times as needed as you loop through the collection.

USE [RECON]

GO

/\*\*\*\*\*\* Object: StoredProcedure [PTS].[USP\_INSERT\_DIAGNOSTICS] Script Date: 09/10/2015 10:18:52 \*\*\*\*\*\*/

SET ANSI\_NULLS ON

GO

SET QUOTED\_IDENTIFIER ON

GO

/\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

Database : RECON

Procedure Name : USP\_INSERT\_DIAGNOSTICS

Date : 10/14/2014

Author : Tom Sawyer

Procedure Desc : This procedure inserts records into Diagnostics table.

Parameters: see below

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

DATE: Developer Change

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10/14/2014 Will Robinson New

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ALTER PROCEDURE [PTS].[USP\_INSERT\_DIAGNOSTICS]

@idn\_pnt AS INT,

@idn\_admsn\_pnt AS INT,

@ambulationCode AS VARCHAR(1),

@psych\_Code\_1 AS VARCHAR(7) ,

@psych\_Code\_Date\_1 AS DATETIME,

@psych\_Code\_NBR\_Order\_1 AS VARCHAR(1),

@psych\_Code\_2 AS VARCHAR(7),

@psych\_Code\_Date\_2 AS DATETIME,

@psych\_Code\_NBR\_Order\_2 AS VARCHAR(1),

@psych\_Code\_3 AS VARCHAR(7),

@psych\_Code\_Date\_3 AS DATETIME,

@psych\_Code\_NBR\_Order\_3 AS VARCHAR(1),

@psych\_Code\_4 AS VARCHAR(7),

@psych\_Code\_Date\_4 AS DATETIME,

@psych\_Code\_NBR\_Order\_4 AS VARCHAR(1),

@psych\_Code\_5 AS VARCHAR(7),

@psych\_Code\_Date\_5 AS DATETIME,

@psych\_Code\_NBR\_Order\_5 AS VARCHAR(1),

@psych\_Code\_6 AS VARCHAR(7),

@psych\_Code\_Date\_6 AS DATETIME,

@psych\_Code\_NBR\_Order\_6 AS VARCHAR(1),

@psych\_Code\_7 AS VARCHAR(7),

@psych\_Code\_Date\_7 AS DATETIME,

@psych\_Code\_NBR\_Order\_7 AS VARCHAR(1),

@substance\_Code\_1 AS VARCHAR(7),

@substance\_Code\_Date\_1 AS DATETIME,

@substance\_Code\_NBR\_Order\_1 AS VARCHAR(1),

@substance\_Code\_2 AS VARCHAR(7),

@substance\_Code\_Date\_2 AS DATETIME,

@substance\_Code\_NBR\_Order\_2 AS VARCHAR(1),

@substance\_Code\_3 AS VARCHAR(7),

@substance\_Code\_Date\_3 AS DATETIME,

@CWOPA\_ID AS VARCHAR(12)

AS

SET NOCOUNT ON;

BEGIN TRY

 BEGIN TRANSACTION;

 INSERT INTO PTS.T\_PNT\_AMBTN

 (

 CDE\_AMBTN,

 IDN\_ADMSN\_PNT,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD

 )

 VALUES

 (

 @ambulationCode,

 @idn\_admsn\_pnt,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID

 )

 if @psych\_Code\_1 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_1)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_1,

 0,

 @psych\_Code\_NBR\_Order\_1,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_1,

 1

 )

 end

 if @psych\_Code\_2 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_2)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_2,

 0,

 @psych\_Code\_NBR\_Order\_2,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_2,

 1

 )

 end

 if @psych\_Code\_3 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_3)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_3,

 0,

 @psych\_Code\_NBR\_Order\_3,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_3,

 1

 )

 end

 if @psych\_Code\_4 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_4)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_4,

 0,

 @psych\_Code\_NBR\_Order\_4,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_4,

 1

 )

 end

 if @psych\_Code\_5 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_5)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_5,

 0,

 @psych\_Code\_NBR\_Order\_5,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_5,

 1

 )

 end

 if @psych\_Code\_6 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_6)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_6,

 0,

 @psych\_Code\_NBR\_Order\_6,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_6,

 1

 )

 end

 if @psych\_Code\_7 IS NOT NULL and LTRIM(RTRIM(@psych\_Code\_7)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @psych\_Code\_Date\_7,

 0,

 @psych\_Code\_NBR\_Order\_7,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @psych\_Code\_7,

 1

 )

 end

 if @substance\_Code\_1 IS NOT NULL and LTRIM(RTRIM(@substance\_Code\_1)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @substance\_Code\_Date\_1,

 0,

 @substance\_Code\_NBR\_Order\_1,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @substance\_Code\_1,

 2

 )

 end

 if @substance\_Code\_2 IS NOT NULL and LTRIM(RTRIM(@substance\_Code\_2)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @substance\_Code\_Date\_2,

 0,

 @substance\_Code\_NBR\_Order\_2,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @substance\_Code\_2,

 2

 )

 end

 if @substance\_Code\_3 IS NOT NULL and LTRIM(RTRIM(@substance\_Code\_3)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @substance\_Code\_Date\_3,

 0,

 @substance\_Code\_NBR\_Order\_3,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @substance\_Code\_3,

 2

 )

 end

 if @substance\_Code\_4 IS NOT NULL and LTRIM(RTRIM(@substance\_Code\_4)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @substance\_Code\_Date\_4,

 0,

 @substance\_Code\_NBR\_Order\_4,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @substance\_Code\_4,

 2

 )

 end

 if @medical\_Code\_1 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_1)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_1,

 0,

 @medical\_Code\_NBR\_Order\_1,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_1,

 3

 )

 end

 if @medical\_Code\_2 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_2)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_2,

 0,

 @medical\_Code\_NBR\_Order\_2,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_2,

 3

 )

 end

 if @medical\_Code\_3 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_3)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_3,

 0,

 @medical\_Code\_NBR\_Order\_3,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_3,

 3

 )

 end

 if @medical\_Code\_4 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_4)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_4,

 0,

 @medical\_Code\_NBR\_Order\_4,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_4,

 3

 )

 end

 if @medical\_Code\_5 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_5)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_5,

 0,

 @medical\_Code\_NBR\_Order\_5,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_5,

 3

 )

 end

 if @medical\_Code\_6 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_6)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_6,

 0,

 @medical\_Code\_NBR\_Order\_6,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_6,

 3

 )

 end

 if @medical\_Code\_7 IS NOT NULL and LTRIM(RTRIM(@medical\_Code\_7)) <> ''

 begin

 INSERT INTO PTS.T\_PNT\_DGNSTC

 (

 DTE\_EFFV\_DGNSTC,

 IND\_RECORD\_ARCD,

 NBR\_ORDER\_DGNSTC,

 DTE\_CREATN\_RECORD,

 IDN\_USER\_CREATN\_RECORD,

 DTE\_UPDTD\_RECORD,

 IDN\_USER\_UPDTD\_RECORD,

 IDN\_ADMSN\_PNT,

 IDN\_DX,

 IDN\_TYPE\_DGNSTC

 )

 VALUES

 (

 @medical\_Code\_Date\_7,

 0,

 @medical\_Code\_NBR\_Order\_7,

 GETDATE(),

 @CWOPA\_ID,

 GETDATE(),

 @CWOPA\_ID,

 @idn\_admsn\_pnt,

 @medical\_Code\_7,

 3

 )

 end

 COMMIT;

END TRY

BEGIN CATCH

 ROLLBACK;

 SELECT

 ERROR\_NUMBER() AS ErrorNumber,

 ERROR\_SEVERITY() AS ErrorSeverity,

 ERROR\_STATE() AS ErrorState,

 ERROR\_PROCEDURE() AS ErrorProcedure,

 ERROR\_LINE() AS ErrorLine,

 ERROR\_MESSAGE() AS ErrorMessage;

END CATCH

**Triggers**

Triggers are to be avoided as they have the potential to cause execute multiple SQL statements without other developer knowledge.

**Constraints**

Planning and creating tables requires identifying how to enforce integrity of the data stored within the columns of the tables. MS SQL Server has the following constraints to enforce integrity:

**Primary Key Constraints** are columns or a column that uniquely identifies a row within a table. All tables should have a primary key and composite primary keys should be avoided. Primary keys should be named PK\_*tablename\_columnname*. For most of your OLTP tables, an identity column is the primary key.

Example: PK\_T\_ADDRESS\_IDN\_ADDR.

**Foreign Key Constraints** are columns or a column that is used to enforce a relation between information in two tables. A link is defined between the two tables when a primary key is referenced by a column or columns in another table. The reference becomes a foreign key in the second table. Foreign keys are named as FK\_*foreignkeytable\_primarykeytable\_columnname.*

Example: FK\_T\_NAME\_T\_ADDRESS\_IDN\_ADDR.

**Indexes**

An index is an on-disk structure associated with a table or a view that speeds retrieval of rows from the table or the view. An index contains keys built from one or more columns in the table or the view. These keys are stored in a structure (B-tree) that enables SQL Server to find the row or rows associated with the key values quickly and efficiently.

A table or view can contain the following types of indexes:

* Clustered
	+ Clustered indexes sort and store the data rows in the table or view based on their key values. These are the columns included in the index definition. There can be only one clustered index per table, because the data rows themselves can be sorted in only one order.
	+ The only time the data rows in a table are stored in sorted order is when the table contains a clustered index. When a table has a clustered index, the table is called a clustered table. If a table has no clustered index, its data rows are stored in an unordered structure called a heap.
* Nonclustered
	+ Nonclustered indexes have a structure separate from the data rows. A nonclustered index contains the nonclustered index key values and each key value entry has a pointer to the data row that contains the key value.
	+ The pointer from an index row in a nonclustered index to a data row is called a row locator. The structure of the row locator depends on whether the data pages are stored in a heap or a clustered table. For a heap, a row locator is a pointer to the row. For a clustered table, the row locator is the clustered index key.

Indexes should be named IDX\_ *tablename\_columnname(s).*

 Example: IDX\_T\_ADDR\_STATE\_STATE

**Default Definitions**

Default Definitions are predefined values created on columns within a table. The default value is used when inserting a new row in a table and a particular column in the insert statement does not have a value. For example you may have a default of all 99999999 that you may want to set up as a default end date. The default has a prefix of D\_ followed by a description of what the default does.

 Example: DF\_OPEN\_DATE

**User Defined Functions**

User defined functions can be created in SQL Server Management Studio to perform actions such as complicated calculations or character string manipulation. User defined functions are created and used for actions repeated within an application. An example is adding dashes to social security number. This user defined function could be created and used any time a correctly formatted social security number is required. User defined functions are named UDF\_*function*.

 Example: UDF\_FORMATSSN

**Transaction and Error Handling**

Try…Catch

Try…Catch, is the preferred error handling method in SQL Server. This method is used in place of the old RAISEERROR.

Errors in Transact-SQL code can be processed by using a TRY…CATCH construct similar to the exception-handling feature of the Microsoft .NET and Microsoft Visual C# languages. A TRY…CATCH construct consists of two parts: a TRY block and a CATCH block. When an error condition is detected in a Transact-SQL statement that is inside a TRY block, control is passed to a CATCH block where the error can be processed.

After the CATCH block handles the exception, control is then transferred to the first Transact-SQL statement that follows the END CATCH statement. If the END CATCH statement is the last statement in a stored procedure or trigger, control is returned to the code that invoked the stored procedure or trigger. Transact-SQL statements in the TRY block following the statement that generates an error is not executed.

If there are no errors inside the TRY block, control passes to the statement immediately after the associated END CATCH statement. If the END CATCH statement is the last statement in a stored procedure or trigger, control is passed to the statement that invoked the stored procedure or trigger.

A TRY block starts with the BEGIN TRY statement and ends with the END TRY statement. One or more Transact-SQL statements can be specified between the BEGIN TRY and END TRY statements.

A TRY block must be followed immediately by a CATCH block. A CATCH block starts with the BEGIN CATCH statement and ends with the END CATCH statement. In Transact-SQL, each TRY block is associated with only one CATCH block.

# Working with TRY…CATCH

When using the TRY…CATCH construct, consider the following guidelines and suggestions:

|  |  |
| --- | --- |
| Each TRY…CATCH construct must be inside a single batch, stored procedure, or trigger. For example, you cannot place a TRY block in one batch and the associated CATCH block in another batch. The following script would generate an error: |  |
| BEGIN TRY   SELECT IDN\_AGENCY, NAM\_AGENCY FROM dbo.T\_AGENCY ORDER BY NAM\_AGENCYEND TRY   BEGIN CATCH SELECT ERROR\_NUMBER() AS ErrorNumber, ERROR\_SEVERITY() AS ErrorSeverity, ERROR\_STATE() AS ErrorState, ERROR\_PROCEDURE() AS ErrorProcedure, ERROR\_LINE() AS ErrorLine, ERROR\_MESSAGE() AS ErrorMessage; END CATCH |

**Transact-SQL Restrictions**

Following is SQL Server functionality that **is not** used when developing procedures or triggers.

Cursors

Cursors are not allowed.

**Looping within Stored Procedures.**

Looping within stored procedures is **prohibited.** Looping is only performed in developer code and not in SQL stored procedures. An infinite loop can bring down SQL Server.

**THIS IS NOT ACCEPTABLE!**

WHILE len(@IDN\_USER) > 0

 BEGIN

 SET @ID\_USER =LEFT(@IDN\_USER, charindex(',', @IDN\_USER+',')-1)

 INSERT INTO dbo.T\_COURSE\_INSTRR

 (IDN\_OFFNG\_COURSE,

 IDN\_USER)

 VALUES (@IDN\_COURSE\_OFFRNG,

 @IDN\_USER)

 END

Use of “\*=” and “=\*” and SQL JOINS- stopping point

Do not use of the “\*=” and ”=\*” join operators in the **WHERE** clause. Use instead the **JOIN** keyword in the **FROM** clause. Microsoft does not recommend the use of “\*=” and ”=\*” and may not provide support for these in future releases of MS SQL Server. Using this syntax for joins is discouraged (by Microsoft) because of the potential for ambiguous interpretation and because it is nonstandard. Be sure to use the join syntax. Instead of using where a = b and b = c, for example, use inner join on a = b, etc. Use left and right outer joins as well as **UNION ALLS** sparingly. Pick the join order carefully. The majority of outer joins can successfully be rewritten as inner joins with tremendous performance improvements.

Use of SELECT INTO

Do not use the **SELECT INTO** clause to create a table on the fly. Instead, create your table before the SELECT statement and use the **INSERT** statement followed by the appropriate **SELECT**.

Usage of Column Prefixes

It is generally recommended to use prefixes for columns appearing in the SELECT list. This is a coding best practice that leads to more maintainable applications.

As an example, it is preferred to have:

      SELECT a.au\_id, a.au\_lname FROM dbo.authors a

Over this:

      SELECT au\_id, au\_lname FROM dbo.authors

Database SQL Options

Database SQL Options should be configured as recommended to remove deprecated behaviors, be ANSI compliant, and be able to leverage the full feature set (indexed views and indexes on computed columns).

The following SQL options should be checked to see if they are configured properly as per Microsoft SQL Options control ANSI compliance options.

The following database SQL Options should be ON:

* ANSI\_NULLS
* ANSI\_PADDING
* ANSI\_WARNINGS
* ARITHABORT
* CONCAT\_NULL\_YIELDS\_NULL
* QUOTED\_IDENTIFIERS

The following should be OFF:

* NUMERIC\_ROUNDABOUT

Use of Defaults and Rules

Database Administrators check stored procedures, functions, views and triggers for existence of defaults and rules.

These objects have been deprecated in favor of CHECK constraints and are not supported in future releases of SQL Server.

Null Comparisons

Database Administrators check stored procedures, views, functions and triggers to flag the use of equality and inequality comparisons involving a NULL constant. These comparisons are undefined when ANSI\_NULLS option is set to ON.

It is recommended to set ANSI\_NULLS to ON and use the IS keyword to compare against NULL constants.

In a future version of SQL Server, ANSI\_NULLS will always be ON and any applications that explicitly set the option to OFF will generate an error. Avoid using this feature in new development work, and plan to modify applications that currently use this feature.

String = Expression Aliasing

Database Administrators check stored procedures, functions, views and triggers for use of column aliases where the name of the expression uses a string value. It is recommended to use quoted identifiers instead. String aliases are not supported in future releases of SQL Server.

As an example, the following syntax is not recommended:

      SELECT 'alias\_for\_col'=au\_id+au\_id FROM dbo.authors

Recommended alternatives are:

    SELECT au\_id+au\_id as "alias\_for\_col" FROM dbo.authors

 SELECT au\_id+au\_id as alias\_for\_col FROM dbo.authors

 SELECT au\_id+au\_id as [alias\_for\_col] FROM dbo.authors

Primary Keys

Database Administrators check all user databases to ensure that all tables have defined either a primary key or have a column with a Unique Constraint defined. Tables without a Primary Key defined or a column with a unique constraint defined will not be approved.

Foreign Keys

Database Administrators check all user databases to ensure that proper foreign key/primary key relationships are created when needed. Foreign keys are also defined as indexes.

Order by Clause with Ordinals

Database Administrators check stored procedures, functions, views and triggers for use of ORDER BY clause specifying ordinal column numbers as sort columns.

As an example, the following syntax is not allowed:

      SELECT au\_id FROM dbo.authors ORDER BY 2, 1

**The use of ordinal column numbers is not be allowed.**

Schema Usage

Use Schema Usage only as needed; otherwise, the default schema ‘dbo’, is used. Database Administrators check stored procedures, functions, views and triggers for use of schema qualified names when referencing tables and views.

Unless specified otherwise, all Transact-SQL references to the name of a database object can be a four-part name in the form:

  [
      *server\_name*.[*database\_name*].[*schema\_name*].
      | *database\_name*.[*schema\_name*].
      | *schema\_name*.
      ]
  ]

When referencing a specific object, it is not necessary to specify the server, database, and owner (schema) for SQL Server to identify the object. However, it is recommended that at least the schema name be specified to identify a table or view inside a stored procedure, function, view or trigger.

When SQL Server looks up a table/view without a schema qualification, it first looks in the default schema and then looks in the **'dbo'** schema. The default schema corresponds to the current user for adhoc batches, and corresponds to the schema of a stored procedure when inside one. In either case, SQL Server incurs an additional runtime cost to verify schema binding of unqualified objects. Applications are more maintainable and may experience a slight performance improvement if object references are schema qualified.

Top without Order By

Database Administrators check stored procedures, functions, views and triggers for usages of TOP in queries without an ORDER BY clause.

It is recommended to specify sort criteria when using TOP clause. Otherwise, the results produced are plan dependent and may lead to undesired behavior.

Usually TOP without ORDER BY is meaningless.

Avoid Stored Procedure Recompiles

See next section.

Production Adhoc Querying

 Real time adhoc reporting against the production database is not permitted. **Microsoft Access** is not allowed to connect to SQL. To do reporting as this causes table locks, performance degradation and creates a security risk.

Hard coded SQL

Hard coded SQL in web pages or applications is not permitted. Put T-SQL in stored procedures for security reasons, efficiency and ease in debugging**.**

**Dynamic SQL is not allowed.**

**Performance Recommendations**

 **General Considerations**

Connections to the SQL Server database are to be brief. A connection is made, a process completed and the connection dropped. No persistent connections to SQL Server are allowed.

Stored procedures perform one process and not a series of processes. It is better to create a stored procedure that performs an insert rather than a stored procedure that performs an insert, update and a delete. Executing multiple stored procedures is preferred over executing one, unwieldy, multi-task stored procedure.

Stored Procedure Recompiles

No stored procedures are to interleave Data Definition Language (DDL) and Data Manipulation Language (DML) operations. In other words, do all **CREATE/DROP** statements separate from **SELECT** and **UPDATE** statements. If data operations are mixed, the SQL server must recompile procedures each time to determine the best plan to use for each new or dropped object. Therefore, coding all creates and drops together reduces the amount of stored procedure compiles. Avoid creating a temporary table in a control-of-flow statement such as an **IF…ELSE** or **WHILE** statement. Avoid using a **DROP** statement for temporary tables in stored procedures, because tables are automatically dropped when the procedure is completed. Specifying the owner of objects such as dbo.Tablename and dbo.Stored procedure name cuts down on recompiles.

Temporary Tables

Often procedure throughput can be dramatically improved by the use of temporary tables. Restructuring a Transact-SQL statement that involves lengthy and/or complicated joins to perform the same functionally by multiple actions against a temp table will improve performance. Please note: use a temporary table to manipulate small amounts of data, and if data exceeds 500 records add an index. Also if you have > 6 data changes in a temporary table consider using the option (keep plan) to avoid unnecessary recompiles.

Table Variable Type

The table variable type functions exactly like the temporary table, with the exception that all data is loaded directly in random access memory.

**Temporary Tables vs. Table Variable**

Database Administrators check stored procedures and triggers for usages of temporary tables that may be replaced by use of table variables.

When a procedure creates a temporary table and has no CREATE INDEX issued on it, and it is dropped all in the same procedure, consider using table variables instead to potentially observe fewer recompilations.

Note that if large data volumes are inserted in the temporary table it may still be preferred to use temporary tables over table variables due to parallel execution restrictions and statistics maintenance.

Indexes

Examine the performance of the statements within the procedure and the entire application to determine if an additional index will justify its overhead. Consider overall index usage all along the development path. Indexes, or lack of indexes, are the direct cause of poor performance 90% of the time. As per Microsoft’s suggestion, all tables that have more than 500 records are to have a clustered index, even if a field is created just to hold the index.

Please note when setting an index, pay close attention to the fill factor for the given index. The fill factor is the amount space consumed by the index and more importantly the amount of space that will be kept free for expansion. For an example a 90% fill factor is 90% full with 10% left for expansion. For tables that do a high volume of inserts, updates, deletes consider a lower fill factor, or perhaps not having a clustered index at all. A clustered index slows down inserts but speed up selects. The developer determines what the best tradeoff is.

Ultimately, it is the responsibility of the developer coding the stored procedures and the SQL code to determine what the best indexes are and how they are used.

Execution Plan

When debugging and tuning a stored procedure, examine the execution plan for clues as to the performance of the procedure and how it may be improved. The reason for execution plan is to determine whether an index is required.

In the example below, execution identifies a missing index that could improve performance.

 From this, one asks if another index should be created to avoid the scan.

 If yes, create an index and rerun.



**SQL Profiler/Database Engine Tuning Advisor**

Two valuable and necessary tools when tracking and or monitoring performance are SQL Profiler and Database Engine Tuning Advisor. Only the DBA has permissions to run these two tools. The DBA can analyze the output from these tools and give suggestions on what tables or objects have problems and can benefit from index creation.

**Programmatic Recommendations**

This section provides recommendations to developers for improving the reliability of procedures and triggers.

Use SET NOCOUNT

When developing procedures that return a result set and use intermediate processing, be sure to set the **SET NOCOUNT ON** option to prevent the generation of unwanted result set count information. Use the **SET NOCOUNT OFF** statement to restore result counting before executing a **SELECT** statement to return results.

Stylistic Recommendations

This section provides recommendations to developers for improving the readability of procedures and triggers.

Nesting IF statements

Avoid, wherever possible, nesting **IF** statements. Use compound Boolean expressions instead.

No more than 4 nested **IF** statements are allowed.

SQL Server 2014 Integration Services

SQL Server Data Tools for Visual Studio 2013 is required when performing extract, transform and load (ETL) processing. Data Tools replaces SQL Server Business Intelligence Development Studio and brings enhancements and improvements to creating and executing packages.

Naming Packages

The name of the SQL Server Integration Services package indicates the database the package belongs to as well as the purpose of the SSIS package. In a development environment, the developer testing the package may own the package but in all other environments SA (System Administrator) owns the package. The package may very well have the same name as the job. The difference between a job and a package is that a job is a scheduled package. A package on its own must be started manually. The package names can be mixed case for ease of readability.

 Example: CUSTOMERVendorExport

SQL Server 2014 Reporting Services

SQL Server 2014 Reporting Services (SSRS) is required when creating any reports for use at the DHS.

Naming Reports

The name of the SQL Server 2014Reporting Services object should indicate the database the report belongs to as well as the purpose of the SSRS package. The report names can be mixed case for ease of readability.

 Example: CUSTOMERNameAndAddresses

Job Naming Standards

A job consists of a series of SQL Statements executed as a transaction (as one complete unit). The name of a SQL SERVER job indicates the database to which the job belongs as well as the purpose of the job. The job name is the same name as the SSIS package.

SA owns the job in all environments. All jobs need DBA approval prior to being scheduled to run. The job names are mixed case for ease of readability.

 Example: ACCOUNTINGImportDailyFiles

**Exemptions from this Standard:**

There will be no exemptions to this standard.

**Refresh Schedule:**

All standards and referenced documentation identified in this standard will be subject to review and possible revision annually or upon request by the HHS Information Technology Delivery Center Domain Leads.

**References:**

Microsoft SQL Server 2012/2014 Books On Line

**Standard Revision Log:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Change Date** | **Version** | **Change Description** | **Author and Organization** |
|  | 1.0 | New document | Kiley Milakovic  |
| 12/11/2007 | 1.1 | SQL Server 2005 revisions | Matt Leitzel |
| 01/13/2011 | 1.2 | SQL Server 2008 revisions | Matt Leitzel |
| 09/15/2016 | 1.3 | SQL Server 2012/2014 revisions | Steve Isleib and Michael Kraus |
| 05/20/2019 | 1.4 | Updated header and margins. | Glenn McDonel |
| 6/5/2020 | 1.5 | Reviewed and updated. | Larry Wary |