

# NIH Budget Entities v1.0

## Status of this Memo

This document specifies a standard for the National Institutes of Health (NIH) and requests discussion and suggestions for improvements. Distribution of this memo is unlimited.

This standard is necessary to support the NIH budget process, for which the NIH Business System (NBS) is the authoritative, enterprise system. This standard, which may warrant a change to existing systems that are part of NIH and IC budget processes, documents and clarifies an existing, undocumented NBS standard.

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# 1 Introduction

This standard defines the major budget entities within the Accounting Code Structure (ACS) that are managed within the developing the NIH Business System (NBS). The general concept of the ACS structure is to allow continual tracking of budget levels as budget amounts are subdivided from general appropriations (usually from Congress) down through the Operating Budgets for NIH Organizations. Intermediate steps between these two budget values are defined to allow for the tracking of funds at desired management levels.

## 1.1 Budget Entity Background

The precise definition of the budget entities from Appropriation to the Operating Budget will be defined. The NIH budget is partitioned when it is received and then it is further sub-divided before it is distributed to individual NIH organizations. The sub-dividing requires the management of multiple budgets at multiple levels by many NIH organizations. This NRFC defines the new rules for sub-dividing budgets that must be followed in order to properly manage funds at NIH.

## 1.2 Intended Audience

This standard is available to the entire NIH community, but it is most relevant to the following NIH stakeholders:

- *Data Architects* – Provide standards for the defining of the business entities that are used across NIH.
- *Database Designers* – Responsible for complying with the standard business entities as applications are designed, implemented and maintained.
- *IT Program Managers* – The managers of projects dealing with budgets who are providing budgeting information that will be complying with the defined budgeting rules.
- *Business Owners of Budgeting Data* – The budget data entities described in this standard are those commonly used by NIH managers to review and report their budget information.

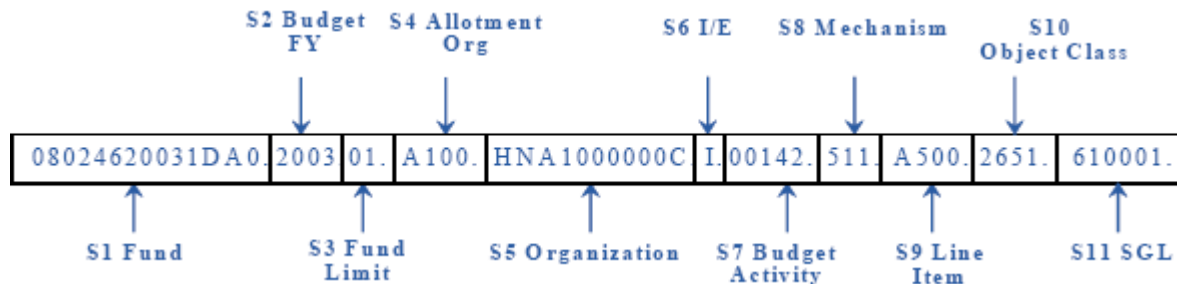
## 1.3 Scope of Standard

This standard is intended to provide a precise definition of the budget data entities required to support the NIH mission across the entire enterprise. Therefore, this standard is applicable to all budgeting efforts at NIH.

This scope of this standard is limited to defining the major budgeting entities. The entities are presented as rules with a limited explanation of the set of population restrictions between the values that populate the rules.

## 2 Budget Entity Types

NIH is in the process of reconfiguring the Accounting Code Structure (ACS) as part of developing the NIH Business System (NBS). The general concept of the ACS structure is to allow continual tracking of budget levels as budget amounts are subdivided from general appropriations (usually from Congress) down through the Operating Budgets for NIH Organizations. Intermediate steps between these two budget values have been defined to allow for the tracking of funds at desired management levels. This analysis defines the new rules for sub-dividing budgets that must be followed in order to properly manage funds at NIH.



**Figure 1** - ACS String of Segment Values that Define Budget Entities

Budgets are reviewed and managed using the data presented in Figure 1 - ACS String of Segment Values that Define Budget . Defining the budget entities requires an understanding of which data strings are associated with a particular budget entity. The first segment contains internal segments that will be explained. In addition to the segments themselves, there are rules that restrict which values can be used based upon values in other segments. Examples of the rules for managing the budget entities will be developed. Individual segments are explained as sentences are created that expresses a budgeting rule.

The breakdown of the new ACS entities will be managed using segment names and descriptions of allowed populations for each segment. A dollar amount is attached to each budget entity to provide a clear expression of the budget rule. Segments commonly associated with the ACS that do not participate in the identification of a budget entity are not part of this analysis. The segments that identify each budget entity are specified.

Most of the segments have a limited set of allowed values (ex: 'fund limit category' must be two digits selected from a limited set of values that have been assigned to: regular budget, small business, diabetes, etc.). Examples of these general population restrictions are specified as the segment is needed for the identification of a budget entity. In many cases there are population restrictions that occur between different segments. An attempt has been made to select segment values that do not have internal constraints that prevent the proper identification of an entity. Multiple internal constraints among multiple segments make creating an instance that does not have a dependent constraint difficult. The interactions of these constraints are discussed for each budget entity but no attempt has been made to identify all of the interdependent constraints.

The standard budget entities start at a high level and then are divided into lower level entities as they continue to be managed as the funds are spent by NIH. This flow down of funds can be described as a waterfall where streams of funds are distributed, while maintaining the ability to manage funds at any level. The budgeting waterfall entity types for budgetary accounts used in departmental reporting are:

- **Appropriation** – Annual funds received for a specified purpose at NIH.
  - **Apportionment** – Quarterly allocation of funds received for a specific purpose at NIH.
    - **Allotment** – Quarterly fund allocations for an organization within a category.
      - **Allowance** - Quarterly fund allocations for an organization within a category and designated as either internal or external.
        - **Operating Budget** - Quarterly fund allocations for an organization within a category designated as either internal or external that are assigned to an organization for a budget activity using a mechanism and further specified by a line item.

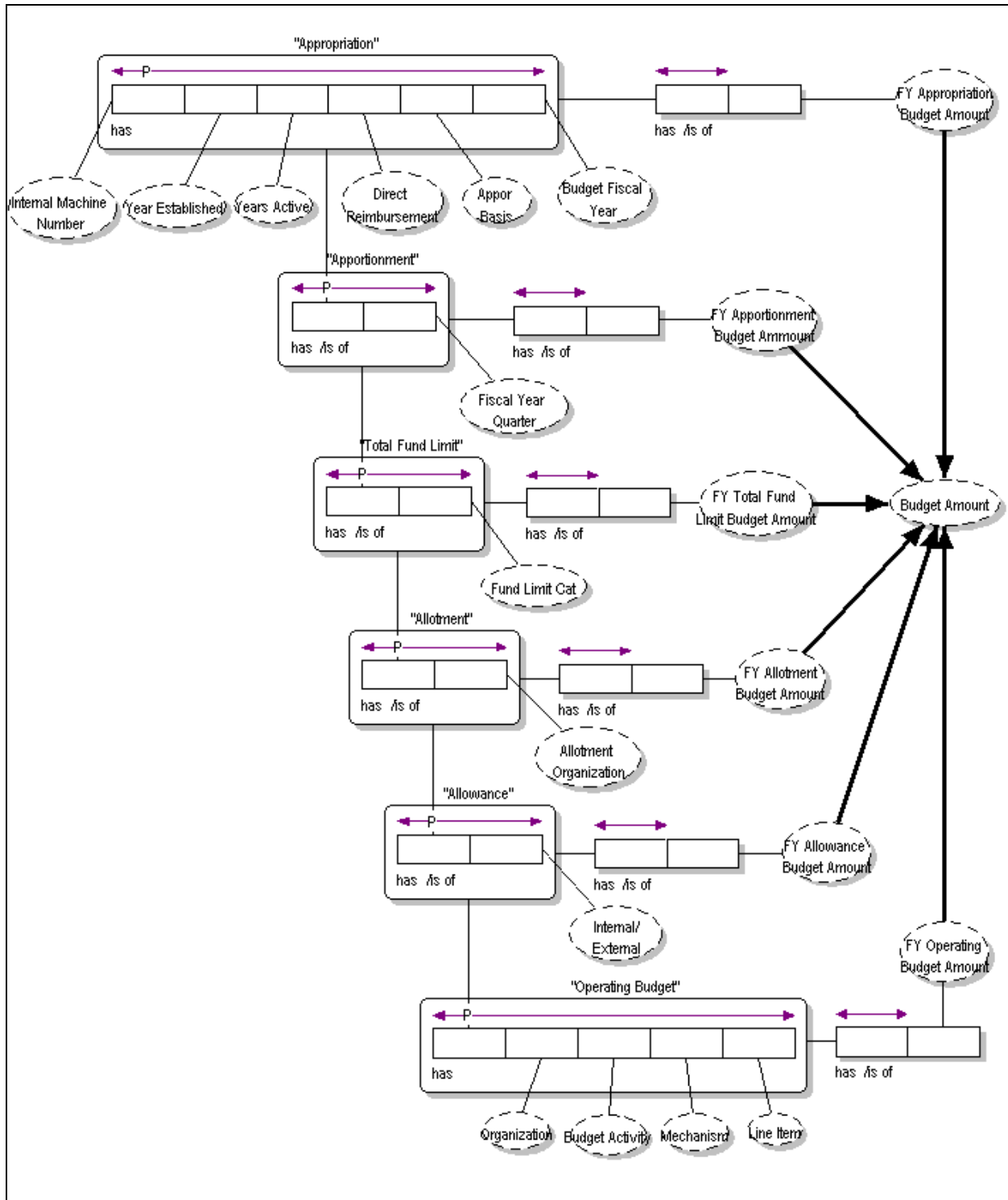
These budget accounts are arranged hierarchically to reflect the inheriting of previous requirements as the reporting becomes more detailed. Each of these definitions are tested in order to validate that the rules described are indeed the rules that must be used to manage budgets at NIH.

A diagram of the Budget Entities is presented in Object Role Modeling (ORM)<sup>1</sup> notation in Figure 2. This diagram is not considered non-normative, it is one of many possible notations that could be used to represent the model and it is intended to provide a summary view of the model and its component entities and relationships.

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<sup>1</sup> For more information on the ORM notation and interpreting ORM models see <http://www.orm.net/>.

Figure 2 – Budget Entities



## 2.1 Appropriation

Appropriation consists of two major segments: Fund and Budget Fiscal Year.

The Fund entity has 7 segmented parts with 5 available for NIH use. The two parts that are not used at NIH are characters 1, 2 and character 14. Character 1, 2 define the Operating Division [NIH is operating division '08' and this is a constant when dealing with NIH funds]. Character 14 is a placeholder consisting of one digit that is reserved for future use by HHS and the value is set to 0.

The remaining 5 segments (Characters 3-13) of the Fund entity are:

| Internal Machine Number | Year Established | Years Active | Direct/Reimbursable | Apportionment Basis |
|-------------------------|------------------|--------------|---------------------|---------------------|
| 0167                    | 2005             | 2            | D                   | A                   |

The Budget Fiscal Year is:

| Budget Fiscal Year |
|--------------------|
| 2006               |

An appropriation is identified by an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the **<Budget Fiscal Year>** fiscal year budget.

An appropriation has a single budget amount associated with it.

| Fiscal Year Appropriation Budget Amount |
|---|
| \$23,500,000                            |

The relationship expressing an appropriation and its associated budget amount is:

An appropriation with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the **<Budget Fiscal Year>** fiscal year budget has an appropriation budget amount of **<FY Appropriation Budget Amount>**.

The values that can be populated in the appropriation relationship are limited by rules for each segment. The population restrictions are based both on allowed values and on business rules that exist among the segments. These example constraints are only illustrative of a more extensive set of constraints that must be managed to maintain valid budgetary accounts.

| Internal Machine Number | Restriction Rules | Example Type         | Valid Instance |
|-------------------------|-------------------|----------------------|----------------|
| 00nn                    | NO YEAR FUNDS     | CRADA                | 0045           |
| 01nn                    | MULTI YEAR FUNDS  | Royalties            | 0183           |
| 02nn                    | ONE YEAR FUNDS    | Annual Appropriation | 0246           |
| 05nn                    | MANAGEMENT FUNDS  |                      | 0566           |
| 09nn                    | GIFTS             |                      | 0910           |

| Established Year | Restriction Rules  |
|------------------|--|
| 2005             | Fiscal Year – (Note: The Budget Fiscal Year is Established Year plus the Years Active minus one unless the Years Active is '0.') |

| Years Active | Restriction Rules  |
|--------------|--|
| 1            | Funds must be utilized in the Appropriation Fiscal Year.   |
| 2-9          | Funds must be utilized in the Appropriation Fiscal Year or within the 2-n years afterwards.  |
| 0            | Funds can be utilized in the Appropriation Fiscal Year or any year afterwards. Funds are available until expended without restriction by fiscal year although they must be apportioned annually. |

| Direct/Reimbursable | Restriction Rules   |
|---------------------|---|
| D                   | Direct – appropriated by Congress or made available by law to the spending organization.  |
| R                   | Reimbursable – provided to the spending organization via another organization, Congressional appropriation, authority, or collection. |

| Apportionment Basis | Restriction Rules         |
|---------------------|---------------------------|
| A                   | Quarterly                 |
| B                   | Program                   |
| C                   | Else (designated by DHHS) |

| Budget Fiscal Year | Restriction Rules  |
|--------------------|--|
| 2005               | Must be the Appropriation Fiscal Year if the Years Active value = 1. Must be within 'n-1' years of the Appropriation Fiscal Year if the Years Active value > 1 where n = the 11 <sup>th</sup> character of the Fund segment. Must be the Appropriation Fiscal Year or later if the Years Active value = 0. |

## 2.2 Apportionment

An apportionment is the amount of an appropriation authorized to be obligated in a given fiscal quarter. Any funds that arrive during a quarter would be included in the current or future quarter apportionment as required by the legislation accompanying them.

The new segment in the apportionment budget entity is the fiscal year quarter:

|                        |
|------------------------|
| Fiscal Year<br>Quarter |
| 1                      |

| Fiscal Year<br>Quarter | Restriction Definition                               |
|------------------------|--|
| 1                      | First quarter of the associated Budget Fiscal Year.  |
| 2                      | Second quarter of the associated Budget Fiscal Year. |
| 3                      | Third quarter of the associated Budget Fiscal Year.  |
| 4                      | Fourth quarter of the associated Budget Fiscal Year. |

[Note: the fiscal quarter is not coded in the NBS account string – it is determined by the date entered with the funding in the FedAdmin module of the NBS.]

An apportionment is identified by an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget.

The dollar amount associated with the apportionment is the Fiscal Year Quarter Apportionment Budget Amount:

|   |
|---|
| Fiscal Year Quarter<br>Apportionment<br>Budget Amount |
| \$6,000,000   |

The relationship expressing an apportionment and its associated budget amount is:

An apportionment with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has an apportionment budget amount **<FY Apportionment Budget Amount>**.

### **2.3 Total Fund Limit**

There is an additional entity that has not been included in the standard budget entities. This entity may be required in the future management of funds between apportionment and allotment. The Total Fund Limit manages the fund limit categories. It consists of the apportionment with the addition of the Fund Limit Category. This budget account is managed and reported by quarter.



The new segment is the fund limit category:

|                        |
|------------------------|
| Fund Limit<br>Category |
| 01                     |

| Fund Limit<br>Category | Restriction Definition      |
|------------------------|-----------------------------|
| 01                     | Regular Budget              |
| 03                     | Small Business              |
| 13                     | Supplemental Small Business |
| 12                     | Diabetes                    |
| 19                     | Superfund                   |
| 05                     | Royalties                   |

Again, these are only a few examples and they are used here as an illustration. Special rules apply to each one of these fund limit categories. For small business, the small business and the supplemental small business would be added to determine compliance with supporting small business. An up to date list is available in the appropriate ORACLE table.

A total fund limit is identified by an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget.

The dollar amount associated with the Total Fund Limit is the Fiscal Year Total Fund Limit Budget Amount:

|  |
|--|
| Fiscal Year Total<br>Fund Limit<br>Budget Amount |
| \$6,000,000                                      |

The relationship expressing a total fund limit and its associated budget amount is:

A total fund limit with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** for the Fiscal Year Quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year total fund limit budget amount of **<FY Total Fund Limit Budget Amount>**.

## 2.4 Allotment

An allotment is the appropriation that is further classified by dividing the funds into fund limit categories and assigning the funds to an allotment organization. This budget account is managed and reported by quarter.

The new segments are the fund limit category and the allotment organization:

| Fund Limit Category | Allotment Organization |
|---------------------|------------------------|
| 01                  | A100                   |

| Fund Limit Category | Restriction Definition      |
|---------------------|-----------------------------|
| 01                  | Regular Budget              |
| 03                  | Small Business              |
| 19                  | Supplemental Small Business |
| 12                  | Diabetes                    |
| 13                  | Superfund                   |
| 05                  | Royalties                   |

There are only a few examples used here, for an up to date list please refer to the appropriate ORACLE table.

| Allotment Organization | Restriction Definition   |
|------------------------|--|
| A100                   | NIH IC or Central Service to whom allotment is issued. The first letter is the third letter of the SAC Code of the allotment organization. |

An allotment is identified by an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget.

The dollar amount associated with the Allotment is the Fiscal Year Allotment Budget Amount:

| Fiscal Year Allotment Budget Amount |
|-------------------------------------|
| \$6,000,000                         |

The relationship expressing an allotment and its associated budget amount is:

An allotment with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year allotment budget amount of **<FY Allotment Budget Amount>**.

## 2.5 Allowance

An allowance is the allotment that is further classified by dividing the funds into internal (NIH operations and research) or external (grantees and contractors) benefit. This budget account is managed and reported by quarter.

The new segment is the Internal/External flag:

|                       |
|-----------------------|
| Internal/<br>External |
| I                     |

| Internal/<br>External | Restriction Definition |
|-----------------------|------------------------|
| I                     | Internal               |
| E                     | External               |

An allowance is identified by an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget.

The dollar amount associated with the Allowance is the Fiscal Year Allowance Budget Amount:

|   |
|---|
| Fiscal Year<br>Allowance Budget<br>Amount |
| \$6,000,000                               |

The relationship expressing an allowance and its associated budget amount is:

An allowance with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year allowance budget amount of **<FY Allowance Budget Amount>**.

## 2.6 Operating Budget

An Operating Budget is the allowance budget that is further classified by dividing the funds into Organization, Budget Activity, Mechanism, and Line Item. This budget account is managed and reported by quarter.

The new segments are Organization, Budget Activity, Mechanism, and Line Item:

| Organization | Budget Activity | Mechanism | Line Item |
|--------------|-----------------|-----------|-----------|
| HNA1000000C  | 142             | 511       | A500      |

| Organization | Restriction Rule  |
|--------------|---|
| HNA1000000C  | Standard Administrative Code (SAC) for the organization as prescribed by DHHS and if the organization is a child (Oracle postable) organization a 'C' is added. |

| Budget Activity | Restriction Rule  |
|-----------------|---|
| 142             | The established programmatic categories defined by Congressional Appropriations process |

| Mechanism | Restriction Rule   |
|-----------|--|
| 511       | The defined vehicles of funding: grant, R&D contract, intramural research or research managements and support. |

| Line Item | Restriction Definition   |
|-----------|--|
| A500      | Any reason for establishing an account other than Organization, Budget Activity or Mechanism |

An operating budget is identified by an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs managed by the organization **<Organization>** for budget activity **<Budget Activity>** with mechanism **<Mechanism>** and line item **<Line Item>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget.

The dollar amount associated with the Operating Budget is the Fiscal Year Operating Budget Amount:

|   |
|---|
| Fiscal Year<br>Operating Budget<br>Amount |
| \$1,000,000                               |

The relationship expressing an operating budget and its associated budget amount is:

An operating budget with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs managed by the organization **<Organization>** for budget activity **<Budget Activity>** with mechanism **<Mechanism>** and line item **<Line Item>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year operating budget amount of **<FY Operating Budget Amount>**.

### 3 Budget Data Entities

Table 1 shows the budget data entities. These entities contain the primary budget data that needs to be collected and managed. For each of the entities, the following information is provided:

- *Entity Name*: The name used to refer to the entity.
- *Definition*: A description of the entity in plain language consistent with common usage within NIH whenever possible.
- *Subject Area*: Topics of interest shared within a community that is used to group entities and align them with business processes.
- *Super Type*: An entity is a specialized form of its super-type and may introduce additional attributes. For example, an organization internal to NIH is a specialized type of organization that may include additional information such as a NIH mail stop or detailed information about membership.
- *Source*: The source of the definition provided.

**Table 1 - Budget Entities**

| <b>#</b> | <b>Entity Name</b> | <b>Definition</b>   | <b>Subject Area</b>        | <b>Super Type</b> | <b>Source</b> |
|----------|--------------------|---|----------------------------|-------------------|---------------|
| 1        | Appropriation      | Annual funds received for a specified purpose at NIH.   | Finance and Administration | Budget Type       |               |
| 2        | Apportionment      | Quarterly allocation of funds received for a specific purpose at NIH.   | Finance and Administration | Budget Type       |               |
| 3        | Total Fund Limit   | Quarterly fund allocations within a category.   | Finance and Administration | Budget Type       |               |
| 4        | Allotment          | Quarterly fund allocations for an organization within a category.   | Finance and Administration | Budget Type       |               |
| 5        | Allowance          | Quarterly fund allocations for an organization within a category and designated as either internal or external.   | Finance and Administration | Budget Type       |               |
| 6        | Operating Budget   | Quarterly fund allocations for an organization within a category designated as either internal or external that are assigned to an organization for a budget activity using a mechanism and further specified by a line item. | Finance and Administration | Budget Type       |               |

Table 1 shows the budget data attributes. Attributes are the placeholders that contain data instances that can be populated in tables. One or more of attributes can be used to identify entities. These attributes define the data instances that are required to identify one or more of the budget entities:

- *Attribute Name*: The name used to refer to the attribute.
- *Definition*: A description of the attribute in plain language consistent with common usage within NIH whenever possible.
- *Entity Name*: The name used to refer to the non-budget entity that the attribute represents.
- *Subject Area*: Topics of interest shared within a community that is used to group entities and align them with business processes.
- *Super-Type*: An entity is a specialized form of its super-type and may introduce additional attributes. For example, an organization internal to NIH is a specialized type of organization that may include additional information such as a NIH mail stop or detailed information about membership.
- *Source*: The source of the definition provided.
- *Examples*: An illustrative example of the attribute being described.

**Table 2 - Budget Attributes**

| #  | Attribute Name          | Definition  | Entity Name  | Subject Area | Super Type | Source  | Examples               |
|----|-------------------------|---|--------------|--------------|------------|---|------------------------|
| 1  | Internal Machine Number | A series of expenditure and receipt account symbols within an appropriation (or fund) assigned by Treasury. |              |              |            | <a href="http://www.knownet.hhs.gov/finance/budexecDR/LAI/ModuleIII/imn.htm">http://www.knownet.hhs.gov/finance/budexecDR/LAI/ModuleIII/imn.htm</a> | 0045, 0183, 0246, 0910 |
| 2  | Year Established        | The fiscal year that the fund was first established.  | Year         |              | Timestamp  |   | 2005, 2006             |
| 3  | Years Active            | The number of years the fund has been active.   |              |              |            |   | 1, 2                   |
| 4  | Direct / Reimbursable   | The source type of funds.   |              |              |            |   | D, R                   |
| 5  | Apportionment Basis     | Establishes whether the funds are time based, project based or independently-defined.                       |              |              |            |   | A, B, C                |
| 6  | Budget Fiscal Year      | The year the funds are to be utilized.  | Year         |              | Timestamp  |   | 2006, 2007             |
| 7  | Fiscal Year Quarter     | The fiscal year quarter that the funds are available.   |              |              | Timestamp  |   | 1, 2, 3, 4             |
| 8  | Fund Limit Category     | Set of funds to allow for tracking expenditure categories.  |              |              |            |   | 01, 03, 05, 19         |
| 9  | Allotment Organization  | Organization responsible for distributing funds.  | Organization | Party        | Party      |   | A100                   |
| 10 | Internal/ External      | Designates whether the funds are to be spent internally at NIH or externally.                               |              |              |            |   | I, E                   |
| 11 | Organization            | Standard Administrative Code (SAC) for the organization.  | Organization | Party        | Party      |   | HNA1000000C            |



| #  | Attribute Name  | Definition  | Entity Name | Subject Area               | Super Type | Source  | Examples     |
|----|-----------------|---|-------------|----------------------------|------------|---|--------------|
| 12 | Budget Activity | Programmatic categories defined by Congressional Appropriations process. This code identifies major activities as set forth in the Budget Appendix.         |             |                            |            | <a href="http://www.knowledgenet.hhs.gov/finance/budgetexecDR/PerformanceSupport/document111.htm">http://www.knowledgenet.hhs.gov/finance/budgetexecDR/PerformanceSupport/document111.htm</a> | 142          |
| 13 | Mechanism       | The vehicle of funding: grant, R&D contract, intramural research or research management and support.  |             |                            |            |   | 511          |
| 14 | Line Item       | Any reason for establishing an account other than Organization, Budget Activity or Mechanism.   |             |                            |            |   | 2006, 2007   |
| 15 | Budget Amount   | The amount of funds available to an organization and the allocation of those funds across various accounts, programs, offices, initiatives, operations, etc | Budget      | Finance and Administration |            |   | \$250,000.00 |

## 4 Budget Data Relationships and Rules

In addition to the defined budget entities and attributes, there are relationships between entities that can be expressed as statements of business rules are shown in Table 3. Two relationships are expressed for each budget entity. The first is the rule for identifying the budget entity and the second is the rule for defining the relationship between the budget entity and the associated funding amount. For each of the relationships a statement of the relationship and an example are provided.

**Table 3 - Budget Relationships**

| # | Relationship/Rule  | Example   |
|---|--|---|
| 1 | An appropriation is identified by an internal machine number of <b>&lt;Internal Machine Number&gt;</b> with a year established of <b>&lt;Year Established&gt;</b> with a years active value of <b>&lt;Years Active&gt;</b> with <b>&lt;Funding Type&gt;</b> funding and an apportionment basis of <b>&lt;Apportionment Basis&gt;</b> for the <b>&lt;Budget Fiscal Year&gt;</b> fiscal year budget.   | An appropriation is identified by an internal machine number of <b>0167</b> with a fiscal year of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> for the <b>2006</b> fiscal year budget.   |
| 2 | An appropriation with an internal machine number of <b>&lt;Internal Machine Number&gt;</b> with a year established of <b>&lt;Year Established&gt;</b> with a years active value of <b>&lt;Years Active&gt;</b> with <b>&lt;Funding Type&gt;</b> funding and an apportionment basis of <b>&lt;Apportionment Basis&gt;</b> for the <b>&lt;Budget Fiscal Year&gt;</b> fiscal year budget has an appropriation budget amount of <b>&lt;FY Appropriation Budget Amount&gt;</b> .  | An appropriation with an internal machine number of <b>0167</b> with a fiscal year of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> for the <b>2006</b> fiscal year budget has an appropriation budget amount of <b>\$23,500,000</b> .                                    |
| 3 | An apportionment is identified by an internal machine number of <b>&lt;Internal Machine Number&gt;</b> with a year established of <b>&lt;Year Established&gt;</b> with a years active value of <b>&lt;Years Active&gt;</b> with <b>&lt;Funding Type&gt;</b> funding and an apportionment basis of <b>&lt;Apportionment Basis&gt;</b> for the fiscal year quarter <b>&lt;Fiscal Year Quarter&gt;</b> of the <b>&lt;Budget Fiscal Year&gt;</b> fiscal year budget.   | An apportionment is identified by an internal machine number of <b>0167</b> with a year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> for the fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget.  |
| 4 | An apportionment with an internal machine number of <b>&lt;Internal Machine Number&gt;</b> with a year established of <b>&lt;Year Established&gt;</b> with a years active value of <b>&lt;Years Active&gt;</b> with <b>&lt;Funding Type&gt;</b> funding and an apportionment basis of <b>&lt;Apportionment Basis&gt;</b> for the fiscal year quarter <b>&lt;Fiscal Year Quarter&gt;</b> of the <b>&lt;Budget Fiscal Year&gt;</b> fiscal year budget has an apportionment budget amount <b>&lt;FY Apportionment Budget Amount&gt;</b> . | An apportionment with internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> for the fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget has an apportionment budget amount of <b>\$8,000,000</b> . |

| # | Relationship/Rule  | Example  |
|---|--|--|
| 5 | A total fund limit is identified by an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget.  | A total fund limit is identified by an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget.   |
| 6 | A total fund limit with an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> for the Fiscal Year Quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget has a fiscal year total fund limit budget amount of <FY Total Fund Limit Budget Amount>.  | A total fund limit with an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget has a fiscal year total fund limit budget amount of <b>\$2,700,000</b> .                                 |
| 7 | An allotment is identified by an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget.   | An allotment is identified by an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> with an allotment organization of <b>A100</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget.   |
| 8 | An allotment with an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget has a fiscal year allotment budget amount of <FY Allotment Budget Amount>. | An allotment with an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> and an allotment organization of <b>A100</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget has a fiscal year allotment budget amount of <b>\$2,000,000</b> . |

| #  | Relationship/Rule   | Example   |
|----|---|---|
| 9  | An allowance is identified by an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for <Internal/External> programs for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget.   | An allowance is identified by an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> and an allotment organization of <b>A100</b> for <b>External</b> programs for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget.  |
| 10 | An allowance with an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for <Internal/External> programs for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget has a fiscal year allowance budget amount of <FY Allowance Budget Amount>.   | An allowance with an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>05</b> and an allotment organization of <b>A100</b> for <b>External</b> programs for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget has a fiscal year allowance budget amount of <b>\$1,900,000</b> .   |
| 11 | A fiscal year operating budget is identified by an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for <Internal/External> programs managed by the organization <Organization> for budget activity <Budget Activity> with mechanism <Mechanism> and line item <Line Item> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget. | A fiscal year operating budget is identified by an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>01</b> and an allotment organization of <b>A100</b> for <b>Internal</b> programs managed by the organization <b>HNA100000C</b> for budget activity <b>142</b> with mechanism <b>511</b> and line item <b>A500</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget. |

| #  | Relationship/Rule   | Example   |
|----|---|---|
| 12 | A fiscal year operating budget with an internal machine number of <Internal Machine Number> with a year established of <Year Established> with a years active value of <Years Active> with <Funding Type> funding and an apportionment basis of <Apportionment Basis> with a fund limit category of <Fund Limit Category> with an allotment organization of <Allotment Organization> for <Internal/External> programs managed by the organization <Organization> for budget activity <Budget Activity> with mechanism <Mechanism> and line item <Line Item> for the fiscal year quarter <Fiscal Year Quarter> of the <Budget Fiscal Year> fiscal year budget has a fiscal year operating budget amount of <FY Operating Budget Amount>. | A fiscal year operating budget with an internal machine number of <b>0167</b> with year established of <b>2005</b> with a years active value of <b>2</b> with <b>Direct</b> funding and an apportionment basis of <b>A</b> with a fund limit category of <b>01</b> and an allotment organization of <b>A100</b> for <b>Internal</b> programs managed by the organization <b>HNA1000000C</b> for budget activity <b>142</b> with mechanism <b>511</b> and line item <b>A500</b> for fiscal year quarter <b>1</b> of the <b>2006</b> fiscal year budget has a fiscal year operating budget amount of <b>\$1,000,000</b> . |

## 5 References

- ISO 11079-3
- DRM v2.0

## 6 Contact

To contact the NRFC Editor, send an email message to [EnterpriseArchitecture@mail.nih.gov](mailto:EnterpriseArchitecture@mail.nih.gov).

## 7 Security Considerations

This NRFC raises no security issues.

## 8 Changes

| Version | Date      | Change  | Authority | Author of Change |
|---------|-----------|---|-----------|------------------|
| 0.1     | 9/29/2006 | Original Draft  | N/A       | John Sharp       |
| 0.2     | 10/2/2006 | - Applied NRFC number.<br>- Removed unapproved standard references. | NRFC0001  | Steve Thornton   |
| 0.3     |           | - Clarification edits made  |           | John Sharp       |
| 1.0     | 1/24/2007 | -Approved by ARB  | ARB       | Steve Thornton   |

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## Appendix A: Validation of the Budget Entities

In order to validate the budget amounts are dependant upon the associated budget entities a set of questions will be asked about each relationship. The questions can be directly answered by subject matter experts who deal with budgets. The answers will be presented in a matrix. The ‘Yes’ answers are part of the identifier of the associated budgeting entity and the ‘No’ answer is the budget amount that is dependant upon the associated budget entity. The fact type is first presented as a true statement. Instances are provided for individual segments involved in the budget entity. The rule is then validated by changing one instance value at a time and asking if the new rule can also be a true statement.

### Appropriation:

The initial true statement for an appropriation is:

An appropriation with internal machine number of **0167** with an appropriation fiscal year of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** for the **2006** fiscal year budget has an appropriation budget amount of **\$23,500,000**.

The appropriation fact type is:

An appropriation with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the **<Budget Fiscal Year>** fiscal year budget has an appropriation budget amount of **<FY Appropriation Budget Amount>**.

| -----    | <Internal Machine Number> | <Year Established> | <Years Active> | <Direct Reimb.> | <Appor Basis> | <Budget Fiscal Year> | <FY Appropriation Budget Amount> | -----    |
|----------|---------------------------|--------------------|----------------|-----------------|---------------|----------------------|----------------------------------|----------|
| Instance | 0167                      | 2005               | 2              | Direct          | A             | 2006                 | \$23,500,000                     | -----    |
| -----    | -----                     |                    |                |                 |               |                      |                                  | Allowed? |
| Q1.1     | another                   | 2005               | 2              | Direct          | A             | 2006                 | \$23,500,000                     | Y        |
| Q1.2     | 0167                      | another            | 2              | Direct          | A             | 2006                 | \$23,500,000                     | Y        |
| Q1.3     | 0167                      | 2005               | another        | Direct          | A             | 2006                 | \$23,500,000                     | Y        |
| Q1.4     | 0167                      | 2005               | 2              | another         | A             | 2006                 | \$23,500,000                     | Y        |
| Q1.5     | 0167                      | 2005               | 2              | Direct          | another       | 2006                 | \$23,500,000                     | Y        |
| Q1.6     | 0167                      | 2005               | 2              | Direct          | A             | another              | \$23,500,000                     | Y        |
| Q1.7     | 0167                      | 2005               | 2              | Direct          | A             | 2006                 | another                          | N        |

The Q1.1 question is: Given the initial true statement, is it allowed for true statement to exist where there is another internal machine number with an appropriation fiscal year of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** has a Fiscal Year Appropriation Budget Amount of **\$23,500,000** for the **2006** Fiscal Year Budget. The ‘Yes’ answer to this question means that the string segment for the ‘Internal Machine Number’ is part of the string that identifies an ‘FY Appropriation Budget Amount.’ The remaining questions are structured and answered in the same manner.

**Note:** See Appendix B for a more detail presentation on answering this matrix.

### Apportionment

The initial true statement for a Fiscal Year Apportionment is:

An apportionment with internal machine number of **0167** with year established of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** for the fiscal year quarter **1** of the **2006** fiscal year budget has a fiscal year quarter apportionment budget amount of **\$8,000,000**.

The appropriation fact type is:

An apportionment with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has an apportionment budget amount **<FY Apportionment Budget Amount>**.

|          | <b>&lt;Internal Machine Number&gt;</b> | <b>&lt;Year Established&gt;</b> | <b>&lt;Years Active&gt;</b> | <b>&lt;Direct Reimb&gt;</b> | <b>&lt;Appor Basis&gt;</b> | <b>&lt;Fiscal Year Qtr&gt;</b> | <b>&lt;Budget Fiscal Year&gt;</b> | <b>&lt;FY Apportionment Budget Amount&gt;</b> |          |
|----------|--|---------------------------------|-----------------------------|-----------------------------|----------------------------|--------------------------------|-----------------------------------|---|----------|
| Instance | 0167                                   | 2005                            | 2                           | Direct                      | A                          | 1                              | 2006                              | \$8,000,000                                   | -----    |
|          |  |                                 |                             |                             |                            |                                |                                   |   | Allowed? |
| Q1.1     | another                                | 2005                            | 2                           | Direct                      | A                          | 1                              | 2006                              | \$8,000,000                                   | Y        |
| Q1.2     | 0167                                   | another                         | 2                           | Direct                      | A                          | 1                              | 2006                              | \$8,000,000                                   | Y        |
| Q1.3     | 0167                                   | 2005                            | another                     | Direct                      | A                          | 1                              | 2006                              | \$8,000,000                                   | Y        |
| Q1.4     | 0167                                   | 2005                            | 2                           | another                     | A                          | 1                              | 2006                              | \$8,000,000                                   | Y        |
| Q1.5     | 0167                                   | 2005                            | 2                           | Direct                      | another                    | 1                              | 2006                              | \$8,000,000                                   | Y        |
| Q1.6     | 0167                                   | 2005                            | 2                           | Direct                      | A                          | another                        | 2006                              | \$8,000,000                                   | Y        |
| Q1.7     | 0167                                   | 2005                            | 2                           | Direct                      | A                          | 1                              | another                           | \$8,000,000                                   | Y        |
| Q1.8     | 0167                                   | 2005                            | 2                           | Direct                      | A                          | 1                              | 2006                              | another                                       | N        |



**Total Fund Limit:**

The initial true statement for a total fund limit is:

The total fund limit with internal machine number of **0167** with year established of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** with a fund limit category of **05** has a Fiscal Year Allotment Total Fund Limit Budget Amount of **\$2,700,000** for fiscal year quarter **1** of the **2006** Fiscal Year Budget.

The total fund limit fact type is:

A total fund with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** for the Fiscal Year Quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year total fund limit budget amount of **<FY Total Fund Limit Budget Amount>**.

|          | <Internal Machine Number> | <Year Established> | <Years Active> | <Direct Reimb> | <Appor Basis> | <Fund Limit Cat> | <Fiscal Year Qtr> | <Budget Fiscal Year> | <FY Tot Fund Limit Budget Amount> |          |
|----------|---------------------------|--------------------|----------------|----------------|---------------|------------------|-------------------|----------------------|-----------------------------------|----------|
| Instance | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | \$2,700,000                       | -----    |
|          |                           |                    |                |                |               |                  |                   |                      |                                   | Allowed? |
| Q1.1     | another                   | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.2     | 0167                      | another            | 2              | Direct         | A             | 05               | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.3     | 0167                      | 2005               | another        | Direct         | A             | 05               | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.4     | 0167                      | 2005               | 2              | another        | A             | 05               | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.5     | 0167                      | 2005               | 2              | Direct         | another       | 05               | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.6     | 0167                      | 2005               | 2              | Direct         | A             | another          | 1                 | 2006                 | \$2,700,000                       | Y        |
| Q1.7     | 0167                      | 2005               | 2              | Direct         | A             | 05               | another           | 2006                 | \$2,700,000                       | Y        |
| Q1.8     | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | another              | \$2,700,000                       | Y        |
| Q1.9     | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | another                           | N        |

**Allotment:**

The initial true statement for an allotment is:

An allotment with internal machine number of **0167** with year established of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** with a fund limit category of **05** and an allotment organization of **A100** for fiscal year quarter **1** of the **2006** fiscal year budget has a fiscal year allotment budget amount of **\$2,000,000**.

The total fund limit fact type is:

An allotment with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year allotment budget amount of **<FY Allotment Budget Amount>**.

|          | <Internal Machine Number> | <Year Established> | <Years Active> | <Direct Reimb> | <Appor Basis> | <Fund Limit Cat> | <Fiscal Year Qtr> | <Budget Fiscal Year> | <Allotment Org> | <FY Allotment Budget Amount> |          |
|----------|---------------------------|--------------------|----------------|----------------|---------------|------------------|-------------------|----------------------|-----------------|------------------------------|----------|
| Instance | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | -----    |
|          |                           |                    |                |                |               |                  |                   |                      |                 |                              | Allowed? |
| Q1.1     | another                   | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.2     | 0167                      | another            | 2              | Direct         | A             | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.3     | 0167                      | 2005               | another        | Direct         | A             | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.4     | 0167                      | 2005               | 2              | another        | A             | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.5     | 0167                      | 2005               | 2              | Direct         | another       | 05               | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.6     | 0167                      | 2005               | 2              | Direct         | A             | another          | 1                 | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.7     | 0167                      | 2005               | 2              | Direct         | A             | 05               | another           | 2006                 | A100            | \$2,000,000                  | Y        |
| Q1.8     | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | another              | A100            | \$2,000,000                  | Y        |
| Q1.9     | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | another         | \$2,000,000                  | Y        |
| Q1.10    | 0167                      | 2005               | 2              | Direct         | A             | 05               | 1                 | 2006                 | A100            | another                      | N        |

**Allowance:**

The initial true statement for an allowance is:

An allowance with internal machine number of **0167** with year established of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** with a fund limit category of **05** and an allotment organization of **A100** for **External** programs has a Fiscal Year Allowance Budget Amount of **\$1,900,000** for fiscal year quarter **1** of the **2006** Fiscal Year Budget.

The allowance fact type is:

An allowance with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year allowance budget amount of **<FY Allowance Budget Amount>**.

| -----    | <Internal Machine Number> | <Year Established> | <Years Active> | <Direct Reimb> | <Appor Basis> | <Fund Limit Cat> | <Allot ment Org> | <Fiscal Year Qtr> | <Budget Fiscal Year> | Internal/ External | <FY Allowance Budget Amount> | -----    |
|----------|---------------------------|--------------------|----------------|----------------|---------------|------------------|------------------|-------------------|----------------------|--------------------|------------------------------|----------|
| Instance | 0167                      | 2005               | 2              | Direct         | A             | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | -----    |
| -----    | -----                     |                    |                |                |               |                  |                  |                   |                      |                    |                              | Allowed? |
| Q1.1     | another                   | 2005               | 2              | Direct         | A             | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.2     | 0167                      | another            | 2              | Direct         | A             | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.3     | 0167                      | 2005               | another        | Direct         | A             | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.4     | 0167                      | 2005               | 2              | another        | A             | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.5     | 0167                      | 2005               | 2              | Direct         | another       | 01               | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.6     | 0167                      | 2005               | 2              | Direct         | A             | another          | A100             | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.7     | 0167                      | 2005               | 2              | Direct         | A             | 01               | another          | 1                 | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.8     | 0167                      | 2005               | 2              | Direct         | A             | 01               | A100             | another           | 2006                 | E                  | \$1,900,000                  | Y        |
| Q1.9     | 0167                      | 2005               | 2              | Direct         | A             | 01               | A100             | 1                 | another              | E                  | \$1,900,000                  | Y        |
| Q1.10    | 0167                      | 2005               | 2              | Direct         | A             | 01               | A100             | 1                 | 2006                 | another            | \$1,900,000                  | Y        |
| Q1.11    | 0167                      | 2005               | 2              | Direct         | A             | 01               | A100             | 1                 | 2006                 | E                  | another                      | N        |

**Operating Budget:**

The initial true statement for an operating budget is:

The fund with internal machine number of **0167** with year established of **2005** with a years active value of **2** with **Direct** funding and an apportionment basis of **A** with a fund limit category of **01** and an allotment organization of **A100** for **Internal** programs managed by the organization **HNA1000000C** for budget activity **142** with mechanism **511** and line item **A500** for fiscal year quarter **1** of the **2006** fiscal year budget has a fiscal year operating budget amount of **\$1,000,000**.

The operating budget fact type is:

An operating budget with an internal machine number of **<Internal Machine Number>** with a year established of **<Year Established>** with a years active value of **<Years Active>** with **<Funding Type>** funding and an apportionment basis of **<Apportionment Basis>** with a fund limit category of **<Fund Limit Category>** with an allotment organization of **<Allotment Organization>** for **<Internal/External>** programs managed by the organization **<Organization>** for budget activity **<Budget Activity>** with mechanism **<Mechanism>** and line item **<Line Item>** for the fiscal year quarter **<Fiscal Year Quarter>** of the **<Budget Fiscal Year>** fiscal year budget has a fiscal year operating budget amount of **<FY Operating Budget Amount>**.

|          | <Internal Machine Number> | <Year Established> | <Years Active> | <Direct Reimb> | <Appor Basis> | <Fund Limit> | <Allot Org> | <Internal External> | <Organization> | <Budget Activity> | <Mecha nism> | <Line Item> | <FY Year Qtr> | <Budget Fiscal Year> | <FY Operating Budget> |          |
|----------|---------------------------|--------------------|----------------|----------------|---------------|--------------|-------------|---------------------|----------------|-------------------|--------------|-------------|---------------|----------------------|-----------------------|----------|
| Instance | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           |          |
|          |                           |                    |                |                |               |              |             |                     |                |                   |              |             |               |                      |                       | Allowed? |
| Q1.1     | another                   | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.2     | 0167                      | another            | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.3     | 0167                      | 2005               | another        | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.4     | 0167                      | 2005               | 2              | another        | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.5     | 0167                      | 2005               | 2              | Direct         | another       | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.6     | 0167                      | 2005               | 2              | Direct         | A             | another      | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.7     | 0167                      | 2005               | 2              | Direct         | A             | 01           | another     | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.8     | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | another             | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.9     | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | another        | 142               | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.10    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | another           | 511          | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.11    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | another      | A500        | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.12    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | another     | 1             | 2006                 | \$1,000,000           | Y        |
| Q1.13    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | another       | 2006                 | \$1,000,000           | Y        |
| Q1.14    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | another              | \$1,000,000           | Y        |
| Q1.15    | 0167                      | 2005               | 2              | Direct         | A             | 01           | A100        | Internal            | HNA1000000C    | 142               | 511          | A500        | 1             | 2006                 | another               | N        |

## Appendix B: NLM (Natural Language Modeling) Validation

Natural Language Modeling (NLM)<sup>2</sup> allows subject matter experts with no experience in reading information model diagrams to create and validate business rules. The analysis procedure is sentence based with no requirement that subject matter experts can understand graphical models or databases.

Natural Language Modeling starts with an instance based true sentence such as:

**Room 254 of building B12 has room type of office.**

This sentence has a fact type presentation of:

**Room <Room Number> of building <Building ID> has room type of <Room Type>.**

The analysis is done by asking a question for each variable in the fact type sentence.

**Given that the sentence “Room 254 of building B12 has room type office.” is true:**

**Q1.1.** Can you have room 254 and another room in building B12 with the room type of office? – **Yes**

**Q1.2.** Can you have room 254 in building B12 and another building with the room type of office? – **Yes**

**Q1.3.** Can you have room 254 in building B12 with the room type of office and another room type? - **No**

The results of this analysis can be expressed as a matrix:

**Room <Room Number> of building <Building ID> has room type of <Room Type>.**

| -----    | <Room Number> | <Building ID> | <Room Type> | -----    |
|----------|---------------|---------------|-------------|----------|
| Instance | 254           | B12           | Office      | -----    |
| -----    |               |               |             | Allowed? |
| Q1.1     | another       | B12           | Office      | Y        |
| Q1.2     | 254           | another       | Office      | Y        |
| Q1.3     | 254           | B12           | another     | N        |

<sup>2</sup> For more information on the NLM notation and interpreting NLM models see <http://www.sharpinformatics.com/>.

A 'yes' answer means that the entity is independent in the fact. A 'no' answer means that the entity is dependent on one or more entities in the fact.

The Q1 matrix is the first step in the NLM procedure. Additional steps would result in finding that a room type is dependent upon both the room number and the building id. The resulting Table would be:

**Room**

|               |               |             |
|---------------|---------------|-------------|
| <Room Number> | <Building ID> | <Room Type> |
|---------------|---------------|-------------|