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ABSTRACT: Notes for operating the Excel Budget Add-In (first release). A quick description:

To save estimate data - *Make sure the estimate spreadsheet is the correct format, enter the job number, then press 'Save Estimate'.*

To run the Labor Status Report – *Enter the job number, then press 'Select Field Report'. From the pop-up window, select the CSV Field Report file for the job. The Labor Status Report will be automatically generated and shown in a new workbook.*

OVERVIEW

The Budget Add-In has two features: one to record system estimate data for a given job, and one to process field reports once the job is in process. In the current design, field reports will be generated from the Bluebeam toolkit created for associating labor phase codes with systems defined in the 'MainForm' tab of the Estimating spreadsheet. The primary goal of the process is to produce the Labor Status Report. Figure 1 shows the components and processes involved in producing this report.
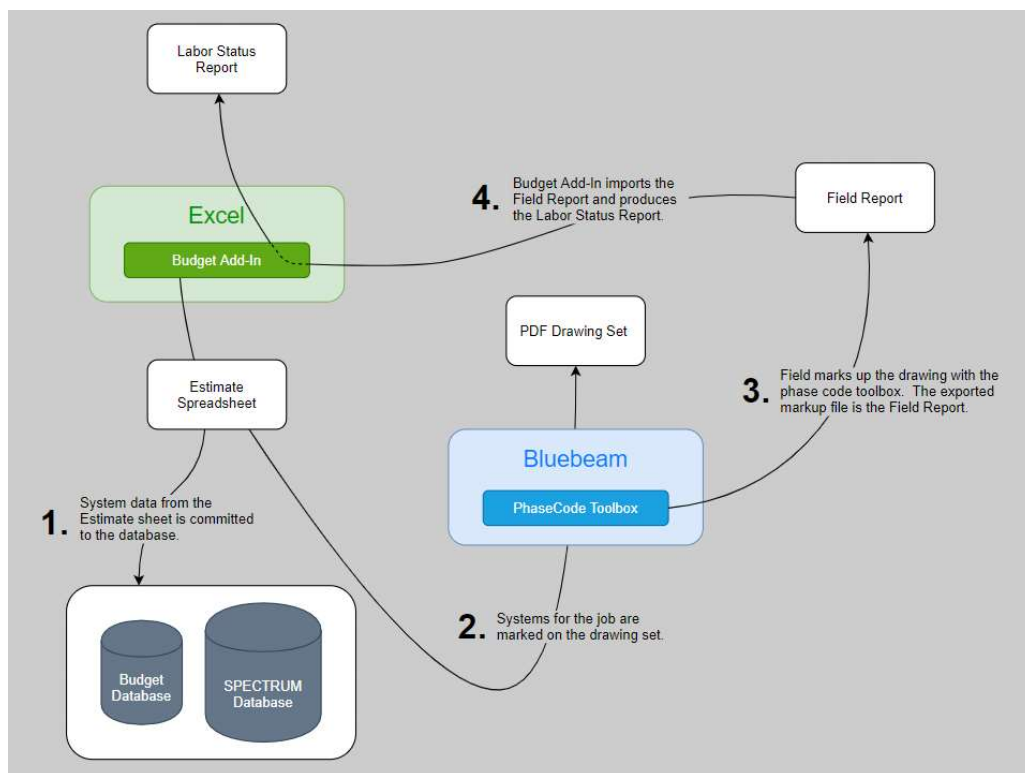

Figure 1 - Components of the Reporting Process

COMPONENTS

The application consists of the following components:

1. Excel
2. Bluebeam

3. Budget Add-In: When installed, this appears in Excel's top Ribbon with the title "Budget" (shown in Figure 2)
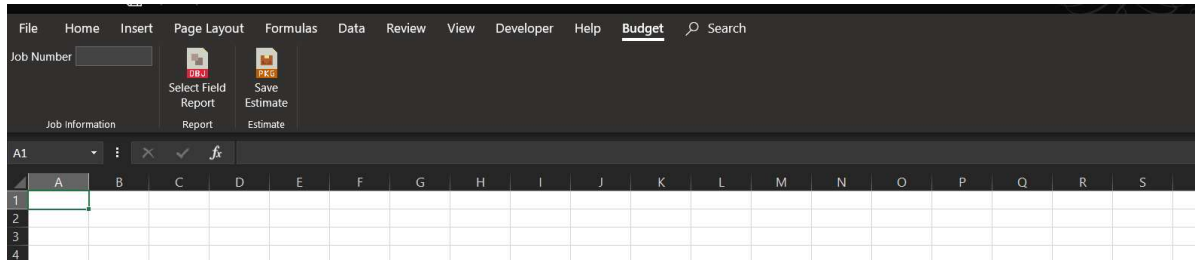

Figure 2 - Budget Add-In Tab in Excel

4. PhaseCode Toolbox: A custom Bluebeam toolbox that allows the user to choose a markup from a list of available phase codes. For more information, see the section on "Workflows" below.
5. Estimate Spreadsheet: The current "system-based" version of the spreadsheet used by the estimating department which is intended as a precursor for the initial project budget.
6. PDF Drawing Set: A current drawing set that includes the required markup file (see "Workflows" below for more information).
7. Field Report: A CSV file extracted from the required markup file associated with the drawing set. Currently, the CSV file must obey the formatting rules outlined later in this document in order to be correctly processed by the Budget Add-In.
8. Labor Status Report: The primary deliverable of the Add-In; the report shows the status of labor hours in terms of "Budgeted", "Earned", and "Actual" hours.

WORKFLOWS

(Reference Figure 1)

1. The estimating departments produces a "system-based" estimate for project hours. This data must be recorded in order to be referenced later when field reports start arriving. Estimate data is committed to a database reserved exclusively for the Excel Add-In. Once the data is recorded, field reports can be processed at any time. The "Save Estimate" button is used to perform this task. Please see the section "Saving Estimate Data" below for a detailed explanation.
2. To represent a given system on a drawing, the user draws an enclosed Polygon using the "Spaces" tool in Bluebeam. When the markup is drawn successfully, Bluebeam prompts the user to name the Space. The Space should be named for the associated system.[1]
3. To report on a phase code, the field user simply selects the desired phase code markup from the PhaseCode toolbox and makes the mark within the boundaries of the polygon belonging to that system's "Space" on the drawing. Markups must be completely enclosed in the polygon in order to be counted correctly. At this point, either the field user or the office user can produce the

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[1] In the current version of the Add-In, it is VERY important that the system names *exactly match the names in the estimate form that was recorded to the database*. For this reason, the user should obtain the list of system names directly from the estimate spreadsheet when preparing drawings with Spaces.

Field Report by exporting the Bluebeam markup file to a CSV file, after verifying that the Columns labeled "Subject" and "Space" are visible in the Bluebeam Markups panel.[2]

4. The Labor Status Report is run automatically when the user imports a valid Field Report file and the Job Number entered in the Budget tab's "Job Number" field is valid. The finished report will open in a new Excel workbook and at that point, the user is free to decide how to save/print/discard the report.

JOB NUMBERS

A valid job number is required for the Budget Add-In to perform any task. A valid job number:

- Has 7 numeric characters (no hyphens, dashes, etc.) and follows the EAI format for job numbers. (*Example*: 2170507)
- Has no more or less than 7 numeric characters.
- (*When importing Field Reports*) Is recorded in the Budget database; if a job number can't be found, it means the estimate data was never committed.
- Must match the job number for the same job in SPECTRUM exactly.

IMPORTING FIELD REPORTS

The Excel add-in currently accepts the following external inputs:

- CSV file with headers (output from Bluebeam PDF)

There is no limit to the amount of information that can be contained in the CSV file. However, for the reporting feature to work correctly, two columns (and their headers) must exist somewhere in the file. The two critical columns are:

"Space"   (Contains the name of the associated equipment system)

"Subject"   (Contains the specific phase code)

These column names come directly from Bluebeam's defaults for the custom toolbox (discussed later in this document) used to produce the CSV file. Since this represents a strong dependency on Bluebeam and one of its particular configurations, design elements have been included to weaken this relationship.[3] It is very important that the import file matches the specified interface or else the reporting feature will not work correctly. It bears repeating that any import file is acceptable *if and only if it contains headers and associated data for the two critical columns "Subject" and "Space".* As long as this condition is met, the import file can contain any amount of additional information and the order in which the critical columns appear is irrelevant.

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[2] Though unlikely to happen, it should be noted here that in the Bluebeam prompt for exporting the markups, the user is provided with an inconspicuous option to exclude the Subject and Space columns from the output file, even though they may still be visible in the Bluebeam interface. This will probably not ever happen, but I'm including this possibility in the event it proves useful while trying to debug a problem.

[3] For example, a helper class was added to the CSV file reader utility to assign the values of "Space" and "Subject" to their corresponding properties within the 'PhaseCode' object (reference Estimating.ProgressReporter.Model for the PhaseCode class definition; reference Estimating.CSVHandler for the PhaseCodeHelper class definition). This decouples the PhaseCode object's property names from the specific file header names in case they should ever change. In addition, the disclosed CSV import template example serves as an explicit interface for any (non-Bluebeam) application wishing to produce a workable import file. Both of these features add flexibility. Hence, the formerly tight dependency on Bluebeam has been made much looser.

Shown below are two examples of acceptable, workable import files. The first contains nothing *but* the critical columns and is in fact the least likely to appear, due to the wide variety of Bluebeam versions and user configurations among company devices. The second is more typical of how field report files will look in practice. Since both files contain headers and associated data for the critical columns, both files are acceptable.

```
Subject,Space,
0001-0601,FC-1,
0001-0401,FC-1,
0001-0601,FC-1,
0001-0601,FC-3,
0001-0601,FC-4
```

Figure 3 - Minimum Required Headers

```
Subject,Page Label,Author,Date,X,Y,Comments,Length,Length Unit,Label,Space,Tags:
0001-0601,[1] M0.00 COVER SHEET,VaderDarthVader,5/20/2020 12:53:42 PM,5.7690 in,21.1926 in,6,,,1,FC-1,
0001-0801,[1] M0.00 COVER SHEET,VaderDarthVader,5/20/2020 12:53:44 PM,10.1226 in,22.6351 in,3,,,2,FC-1,
0001-0701,[1] M0.00 COVER SHEET,VaderDarthVader,5/20/2020 12:53:46 PM,8.7153 in,23.1691 in,3,,,20,FC-1,
0001-0501,[1] M0.00 COVER SHEET,VaderDarthVader,5/20/2020 12:53:49 PM,12.7251 in,22.2451 in,4,,,10,FC-1,
Carrier,[1] M2.10 ROOF HVAC PLAN,Jessicas,2/18/2020 11:57:57 AM,28.0467 in,12.0049 in,1,,,,,RTU-1
Carrier,[1] M2.10 ROOF HVAC PLAN,Jessicas,2/18/2020 11:58:21 AM,11.8421 in,17.2247 in,2,,,,,RTU-2
CO/NO2,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/17/2020 3:46:39 PM,15.7789 in,14.6046 in,3,,,,,
CO/NO2,[5] M2.03 LEVEL 1 HVAC PLAN,Jessicas,2/17/2020 3:47:28 PM,,,1,,,,,
CO/NO2,[5] M2.03 LEVEL 1 HVAC PLAN,Jessicas,2/17/2020 3:48:00 PM,,,1,,,,,
Delta,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/18/2020 12:05:49 PM,27.9950 in,16.2961 in,1,,,,,EF-P108
Delta,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/18/2020 12:05:58 PM,8.8711 in,17.6108 in,2,,,,,EF-P107
Delta,[5] M2.03 LEVEL 1 HVAC PLAN,Jessicas,2/18/2020 12:06:03 PM,13.0020 in,7.9758 in,3,,,,,EF-111
Delta,[5] M2.03 LEVEL 1 HVAC PLAN,Jessicas,2/18/2020 12:06:09 PM,15.7962 in,9.0000 in,4,,,,,EF-112
Delta,[11] M2.08 LEVEL 6 HVAC PLAN,Jessicas,2/18/2020 12:06:15 PM,15.3616 in,16.9885 in,5,,,,,EF-603B
Delta,[12] M2.09 LEVEL 6 LOFT HVAC PLAN,Jessicas,2/18/2020 12:06:30 PM,16.3116 in,16.1471 in,6,,,,,EF-R658
Fantech,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/18/2020 12:07:24 PM,29.7648 in,11.1868 in,1,,,,,GTF-2
Fantech,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/18/2020 12:07:29 PM,15.0148 in,10.7946 in,2,,,,,GTF-1
Fantech,[1] M2.03X LEVEL 1 MEZZ HVAC PLAN,Jessicas,2/18/2020 12:07:37 PM,27.9324 in,19.0363 in,3,,,,,EF-109
Fantech,[1] M2.03X LEVEL 1 MEZZ HVAC PLAN,Jessicas,2/18/2020 12:07:47 PM,28.0154 in,18.7799 in,4,,,,,EF-108
FD-A,[4] M2.02 LEVEL P01 HVAC PLAN,Jessicas,2/18/2020 12:08:14 PM,17.0886 in,16.4168 in,,,,,,10X6
FD-C,[5] M2.03 LEVEL 1 HVAC PLAN,Jessicas,2/18/2020 12:08:29 PM,16.5450 in,13.2037 in,,,,,,36X14
FSD-A,[7] M2.04 LEVEL 2 HVAC PLAN,Jessicas,2/18/2020 12:08:46 PM,14.4275 in,16.5082 in,,,,,,16X16 120V
FSD-A,[7] M2.04 LEVEL 2 HVAC PLAN,Jessicas,2/18/2020 12:08:58 PM,29.3629 in,14.1124 in,,,,,,18X18 120V
FSD-A,[8] M2.05 LEVEL 3 HVAC PLAN,Jessicas,2/18/2020 12:09:11 PM,14.2111 in,16.4490 in,,,,,,24X24 120V
FSD-A,[8] M2.05 LEVEL 3 HVAC PLAN,Jessicas,2/18/2020 12:10:44 PM,29.3021 in,13.9974 in,,,,,,18X18 120V
FSD-A,[9] M2.06 LEVEL 4 HVAC PLAN,Jessicas,2/18/2020 12:10:53 PM,29.3097 in,14.1581 in,,,,,,18X18 120V
FSD-A,[9] M2.06 LEVEL 4 HVAC PLAN,Jessicas,2/18/2020 12:10:58 PM,14.3782 in,16.5041 in,,,,,,16X16 120V
FSD-A,[10] M2.07 LEVEL 5 HVAC PLAN,Jessicas,2/18/2020 12:11:06 PM,14.0313 in,16.5964 in,,,,,,24X24 120V
FSD-A,[10] M2.07 LEVEL 5 HVAC PLAN,Jessicas,2/18/2020 12:11:14 PM,29.2644 in,14.0526 in,,,,,,18X18 120V
FSD-A,[11] M2.08 LEVEL 6 HVAC PLAN,Jessicas,2/18/2020 12:11:28 PM,14.4296 in,16.4792 in,,,,,,16X16 120V
FSD-A,[11] M2.08 LEVEL 6 HVAC PLAN,Jessicas,2/18/2020 12:11:32 PM,29.3933 in,14.0703 in,,,,,,18X18 120V
```

Figure 4 - Typical Example

In Figure 4, notice the presence and absence of information, as well as the apparent lack of homogeneity for data values within any single column. One of the features of the add-in is that the reporting feature remains unphased by this mishmash; it is quite capable of filtering out what it needs and ignoring the rest. What's important here is that the sufficient condition *has been met*, not that it has been exceeded

In figures 3 & 4, make note of the following:

1. The headers, which represent the column names, appear in the first line of the file.
2. No Spaces appear between the first letter of a header entry and the comma before it. For example: "Subject,Space" is allowed, but "Subject, Space" is not allowed.

As long as these rules are followed, you can create an importable CSV field report for the Excel add-in using any application you wish, not just Bluebeam.

FORMATTING REQUIREMENTS

All this flexibility is provided by establishing some very rigid conditions. Only the disciplined are free. The following list outlines non-negotiable format requirements that must be met for the application to work.

1. Job Numbers must contain exactly 7 numeric digits. Non numeric characters are not allowed. (EXAMPLE: Job #217-0507 must be entered as "2170507")[4].
2. The CSV file must contain headers and associated data for the critical fields, as described in this section. Since the requirements were reiterated several times, they won't be repeated here.
3. Phase Codes must obey the format '0000-0000' (a group of 4 numeric characters followed by another group of 4 numeric characters, with a hyphen between the two groups). This is not currently the format used by SPECTRUM, so it is an expedient choice. There are two critical areas that must be checked for phase code formats: 1) the Estimating sheet containing the job estimate, and 2) the Bluebeam toolbox used to mark the phase codes. The formatting in these two sources must be the same; if it is, then the CSV file is almost guaranteed to have the correct formatting, and the file can be processed correctly.

SAVING ESTIMATE DATA

A database record of an estimate must exist for field reports to be meaningfully interpreted. The "Save Estimate" button performs the task of creating this record. Estimate data must be associated with a job number, which is taken from the job number field in the Budget tab. *This means that estimates should be saved after being assigned an official EAI job number, and no sooner*. In the current iteration, there is no interface for the user to update the job number if it changes, so committing the data should be considered an important gesture (perhaps it could happen near the conclusion of the Budget meeting)[5].

To save an estimate record, the Estimate form must be the active Excel workbook and the 'MainForm' tab must be the active tab. If the first condition is met but the user is on another tab, the budget tool will automatically attempt to activate the 'MainForm' tab. If this attempt is successful, everything will proceed as usual. If it is not, or if the user has a different workbook activated, one of several error messages will be displayed and the process will abort.

FORMATTING ESTIMATE DATA

For the systems contained in the Estimate to be recognized correctly by the Budget tool, several formatting rules must be obeyed. Figure 3 shows an example of correct formatting.

1. Each system must be separated from the one above and below with *at least one* blank row.

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[4] This is not an arbitrary choice. SPECTRUM stores job numbers in a fixed-width field of 10 characters, padding the beginning with spaces to round this out. For example, job number '2170507' is stored in SPECTRUM as '   2170507' (padded with 3 spaces at the beginning). Previous EAI practice was to assign letter suffixes and other formats as needed, and applications like SILO and AIRE are aware of the 10-character field width and are prepared to handle this case. However, current (and future?) policy is to restrict job numbers to 7 numeric characters as described.

[5] Updating a job number that has changed would require making hard changes to the database. That's fairly simple and quick (depending on how many systems are included in the estimate), but does require an authorized IT person.

2. Every system must have an associated entry in the 'Type' column *in the same row as the system name.* A row that contains a system name in Column A but no entry in Column B of the same row will be ignored by the application.

3. Systems can be associated with multiple 'Type' category entries, which should be listed contiguously in Column B. See the system "lower level ERV" on line 11 in Figure 3; this system has three associated types: "ERV", "md", and "medlouver". Note also that the entire system is bordered on the bottom with a blank row (line 14) to separate it from the next system ("upperlevel ductless"). One last thing to note from Figure 3 is how every system entry is accompanied by at least one entry in the 'Type' column; this is an illustration of the 2nd formatting rule just mentioned above.

	System	Type	QTY	Cost	Hrs	Hrs (LC)	Mat	Hrs	Hrs
2									
3	ODU	VRF(OU>16)	1	$ 1,000	12		$ 300	4	
4									
5	BC	VRF(BC)	1	$ 200	4				
6									
7	Lower level ductless	VRF(Ductless)	3		3				
8									
9	lower level vestibule	VRF(Ductless)	1		3				
10									
11	lower level ERV	ERV	1	$ 300	4		$ 900	4	40
12		md	2	$ 120	1				
13		medlouver	2	$ 200	2				
14									
15	upperlevel ductless	vrf(ductless)	17	$ 100	3				
16									

Figure 5 - Blank Rows Separate System Entries

4. Ideally, every system should be given a unique name. Currently, the application does not enforce this constraint when saving Estimate Data. Be aware that if two separate system entries have the same name, their information will be merged when it is retrieved from the database for reporting because the application has not been endowed with the ability to tell the systems apart once they are committed to the database.