

User's Manual

KYTC Lightweight Material on Culvert Design Web Application
Charlie Sun and Christopher Van Dyke

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1. INTRODUCTION

The Lightweight Material on Culvert Design web application¹, developed by the Kentucky Transportation Cabinet (KYTC) and accessible at <http://lightweightonculvert.uky.edu/>, serves as a specialized platform dedicated to the submission of lightweight material profile designs for culverts into the KYTC centralized database. This web application has been meticulously designed to streamline the exploration of various lightweight material arrangements within specified embankment boundaries, thereby simplifying the task of identifying feasible and efficient lightweight fill configurations. Users are empowered to conveniently attach accompanying images and documents directly within the application.

Anticipated to be primarily utilized by two (2) key user groups, namely KYTC Engineers/Officers and Designers (comprising vendors and contractors) engaged in highway expansion projects, this web application empowers primary users (Designers) to submit lightweight material profile designs for culverts seamlessly via the online platform. The central office, in turn, efficiently processes and assesses these digital submissions, facilitating clear and open communication between designers and the central office throughout the entire process of submitting and accepting lightweight material profile designs for culverts.

To facilitate user understanding and maximize the utility of the web application, the following sections provide an extensive overview of its features and offer comprehensive guidance on their utilization. Visual representations of the web application's diverse graphical user interfaces are also included to enhance clarity and user-friendliness.

¹ Referred to hereafter in this guide as *web application*.

2. OVERALL WEB PAGE SETTING

All functioning web pages on the web application are divided into three sections — **Header**, **Main Content**, and **Footer** (Figures 1).

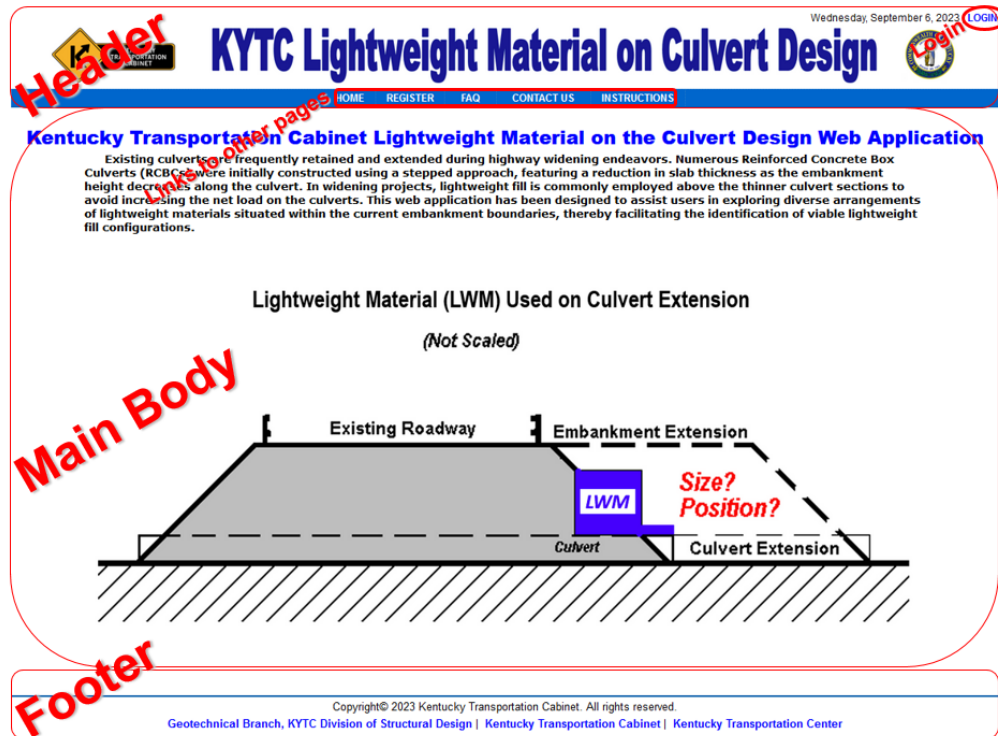


Figure 1. Overall web page setting: Links to other pages and LOGIN page are in Header Portion

2.1 Header

The **Header** is fixed at the top of each page and has two different settings for before and after login. The contents present before *and* after login include web title, date and time, and links to **HOME** and **INSTRUCTIONS**. Before login, there are also links to **LOGIN** (upper right corner of the page), **REGISTER**, **FAQ**, and **CONTACT US**. After login, the user's first name appears on the top line and the **LOGIN** link is replaced with **LOGOUT** in the top right corner. Links for **EXISTING DESIGN**, **NEW DESIGN** and **MY ACCOUNT** appear for users who are registered as Designers and Central Office Lightweight Material on Culvert Design manager. Additional link, **USER ADMIN** appears for Central Office Lightweight Material on Culvert Design manager.

2.2 Main Content

The **Main Content** section of each page hosts the different functioning pages, which are illustrated in detail later.

2.3 Footer

The **Footer** contains links to related web sites such as **Geotechnical Branch, KYTC Division of Structural Design, Kentucky Transportation Cabinet, and Kentucky Transportation Center.**

3. USER AS A NON-REGISTERED USER

Non-registered user can register as **Designer** and receive instant approval from the web application's management system. The functions described below are available to non-registered users in the **Header** section.

3.1 HOME – *Default Page of Web Application*

The **HOME** link is the first link in the **Header**'s last line (Figure 1). Clicking this link loads the web application's home page (Figure 1). This is the web application's default page and briefly introduces the application.

3.2 REGISTER – *Get Approval Instantly from Web Application Management System*

The **REGISTER** link is the second link in the **Header**'s last line (Figure 1). After clicking this link, user is asked to supply personal information to create their account (Figure 2). If a red asterisk appears next to a field, the user must provide the required information to complete their registration. Required information includes **First Name**, **Last Name**, **Email** (which is used as the **Login ID** by the user and for all correspondence email sent by administrators), **Password** (created by the user), **Phone Number**, **Street Address**, **City**, **State**, **Zip Code**, **Country**, and **Organization**. **Designer** is the only option for user **Designation** for now. If registrant's email domain contains "gmail" or "yahoo", or does not exist in current user database, they will be assigned as a **UserTBA** temporarily and wait further verification by administrator from web application. The **UserTBA** can view all the existing designs in different stages, such as **Initiated**, **Submitted**, **Accepted**, and **All Existing Designs**. Some information (e.g., **Fax Number**, **Web Site**, and **Description**) is optional. Information supplied by the user is confidential and maintained in the web application management system. Passwords are encrypted and stored in the web application management system as well.

After the user enters all the required information and clicks the **Register** button, the page shown in Figure 3 appears. This page informs the user: "*An activation link has been sent to your email address. Please follow the instructions in the email to activate your account.*"

Figure 4 is an image of the email sent to the user.

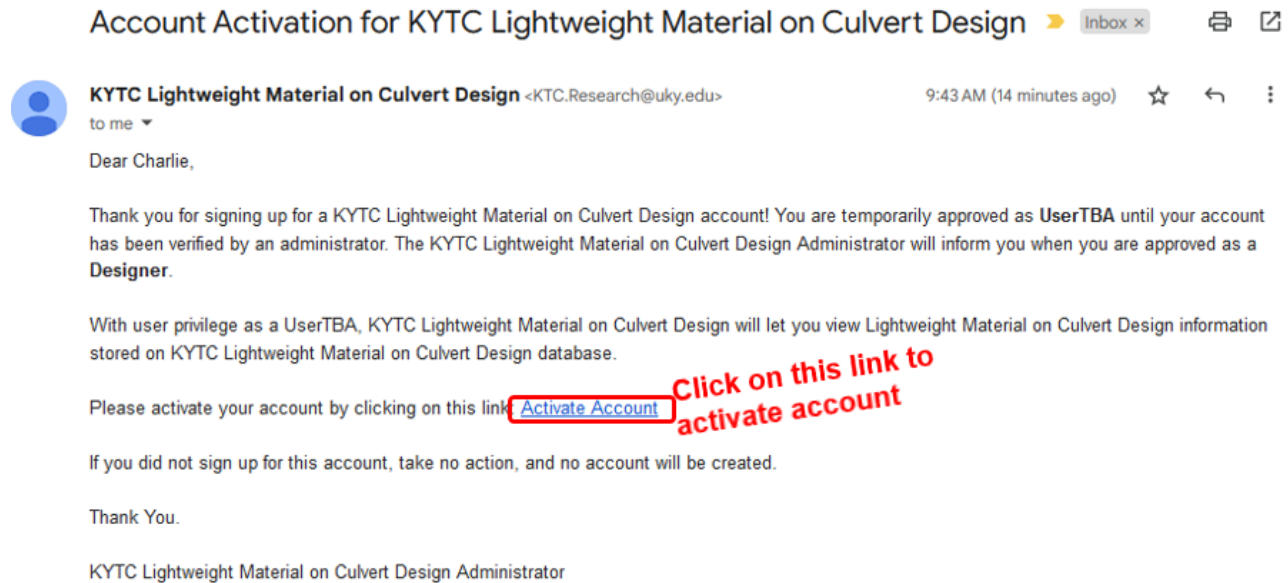


Figure 4. Email provides a link to activate user's account

A user can immediately activate their account by clicking on the link provided in the email. The **Activation** page (Figure 5) informs the new user of their account activation status. If activation is successful, the registered user may click on the **LOGIN** link, which is located on the upper right corner of the page, to log into the system by using **LOGIN** page (Figure 10).



Figure 5. Screen after activating user's account

3.3 FAQ – *Frequently Asked Questions*

FAQ link is the third link in the **Header**'s last line (Figure 1). This link provides straightforward answers to frequently asked questions about the web application (Figure 6).

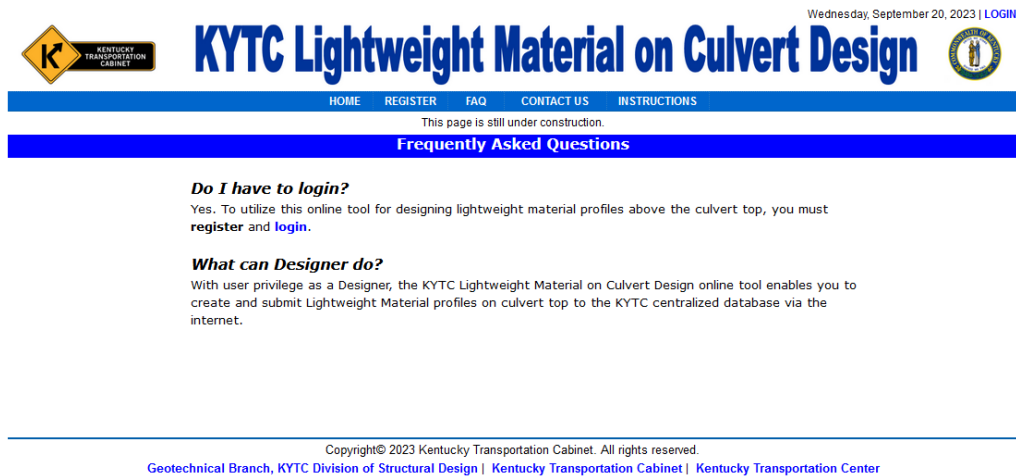


Figure 6. FAQ page provides straightforward answers to frequently asked questions about the web application

3.4 CONTACT US – *Communicating with Web Application Administrator*

The **CONTACT US** link is the fourth link in the **Header**'s last line (Figure 1). The **CONTACT US** page offers a portal for users to communicate with a system administrator (Figure 7). The users may either use physical address to send regular mail; or they may supply the required information and click the **Send** button. Clicking the **Send** button generates an email that is sent by the system to both the sender and the web application administrator.

Wednesday, September 20, 2023 | [LOGIN](#)

KYTC Lightweight Material on Culvert Design

HOME REGISTER FAQ CONTACT US INSTRUCTIONS

Contact Us

Please contact **Geotechnical Branch, Division of Structural Design**, Kentucky Transportation Cabinet via email, phone or the form below if you have any comments, questions, suggestions, or concerns about Lightweight Material on Culvert Design web site.

You can send regular mail to:

Geotechnical Branch
Division of Structural Design
1236 Wilkinson Blvd
Frankfort, KY 40601
Phone: (502) 564-2374

Use this address to Send regular mail

Or, you can send email by filling following information:

Your Name *

Email Address *

Organization

Phone Number

Fax Number

Subject *

Comments *

*Required Fields

Send message after filling in all the information

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Figure 7. **CONTACT US** screen

3.5 INSTRUCTIONS

The **INSTRUCTIONS** link is the **Header**'s final link (Figure 1). Under this link, users find a *Quick Start Guide* and a *User's Manual* (Figure 8). The *Quick Start Guide* presents brief instructions for using this web application; the *Manual* provides more detailed instructions. Users can view it online or download a copy for printing.



Figure 8. INSTRUCTIONS screen

4. USER AS A DESIGNER

Designer is a registered user and belongs to a major group on the web application. They can instantly activate their account after registering and following directions shown on the screen. If the **Designer** does not activate their account, the administrator can send them a notification email with the activating link or activate the account on their behalf. Personal information can be modified by clicking on the **MY ACCOUNT** link. In contrast to unregistered users, a **Designer** enjoys enhanced access privileges. They can view **Initiated**, **Submitted**, **Accepted**, and **All Existing Designs** (as depicted in Figure 9). **Designers** are also empowered to submit their own designs, share designs with fellow **Designers** within the same group, upload attachments, and submit their designs online.



Figure 9. Designers can view all the designs at different stages

4.1 LOGIN

Figure 10 displays the **LOGIN** page. This page is the gateway for registered users to access the web application. A **Designer** may **Log In** by entering their email address, password into the appropriate fields in the **Login** area, and clicking on **Sign In** button.

Wednesday, September 27, 2023 | [LOGIN](#)

KYTC Lightweight Material on Culvert Design

HOME REGISTER FAQ CONTACT US INSTRUCTIONS

Login

Please login using your Email Address and Password.

Email Address

Password [Forgotten Password](#)

[Sign In](#)

Type email address and password to login

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Figure 10. **LOGIN** page

4.2 FORGOTTEN PASSWORD

If a user forgets their login password, they can click **Forgotten Password** link shown in Figure 10. Clicking this link takes the user to a page where they can reset their password (Figure 11). On the **Forgotten Password** page, a user enters their registered email address and clicks the **Reset Password** button. This creates a temporary, randomly generated password and emails it to the user. An instance instruction is shown on screen (Figure 12) and the email like one in Figure 13 is sent to user. Once the user logs in with their temporary password, the user is prompted to immediately proceed to the **MY ACCOUNT** page and update their password.

Wednesday, September 27, 2023 | [LOGIN](#)

KYTC Lightweight Material on Culvert Design

[HOME](#) [REGISTER](#) [FAQ](#) [CONTACT US](#) [INSTRUCTIONS](#)

Forgotten Password

To reset your password, please enter the email address when you registered on Lightweight Material on Culvert Design.

Email Address

[Reset Password](#)

Click to reset password *Input email address when registered*

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Figure 11. **Reset Password** screen

Wednesday, September 27, 2023 | [LOGIN](#)

KYTC Lightweight Material on Culvert Design

[HOME](#) [REGISTER](#) [FAQ](#) [CONTACT US](#) [INSTRUCTIONS](#)

Forgotten Password

An email has been sent to '[REDACTED]'.
In the email you will find a temporary password to log in.
You will be redirected to the Login page in seconds.

Read carefully

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Figure 12. Brief instruction is shown on screen

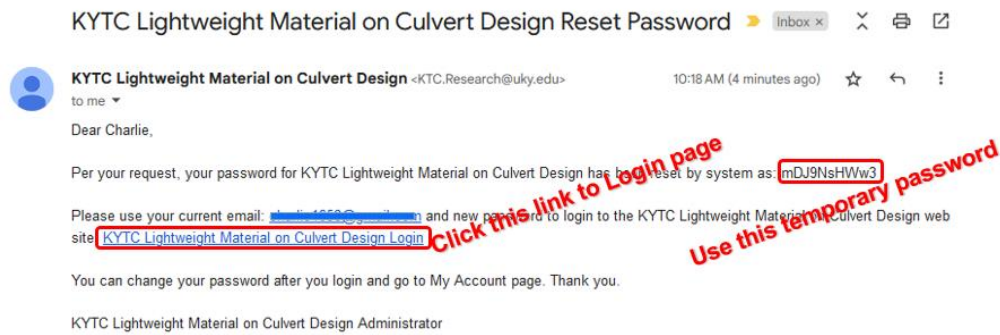


Figure 13. Temporary password created and included in email

4.3 Starting Page after LOGIN

The **INSTRUCTIONS** page (Figure 9) appears following login. The **Designer** has access to new links like **EXISTING DESIGN**, **NEW DESIGN**, and **MY ACCOUNT**. When you hover your mouse over the **EXISTING DESIGN** link, you'll see dropdown links for **Design Initiated**, **Submitted**, **Accepted**, and **All Existing Designs**. A **Designer** can edit their own and their group's existing designs which have not been submitted from the design list; they can have the new design by clicking on **NEW DESIGN** link; and they can modify their personal information by clicking on **MY ACCOUNT** link.

4.4 EXISTING DESIGN

Sub-links for **Design Initiated**, **Submitted**, **Accepted** and **All Existing Designs** will show up when user's mouse hover over the link **EXISTING DESIGN** (Figure 9). Each sub-link will open a corresponding list per design status. Figure 14 shows a list including all existing designs currently housed in the web application when the sub-link **All Existing Designs** is clicked. All titles of columns function like “**sort by**” key when any title is clicked. The list in Figure 14 is sorted by column of **County**, which is default sort order. The first clicking on any title will bring list sorted ascending by this column; the second clicking on same title will bring list sorted descending by this column. Keeping clicking on same title will bring the list sorted back and forth between ascending and descending by this column. In the **String Included** cell, when any string or number is entered and the **Search Design** button is clicked, all designs that include that string in **County**, **Route No.**, **Soil Type**, **LWM Type**, **Submit By**, or equal that number in **District**, **Culvert Width**, **Culvert Height**, **Existing Fill Height**, **New Fill Height**, **Soil Elastic Modulus**, **Soil Density**, **LWM Elastic Modulus**, and **LWM Density** will be displayed.

Sunday, October 15, 2023 | Hello, Charlie | [LOGOUT](#)



KYTC Lightweight Material on Culvert Design



[HOME](#) [EXISTING DESIGN](#) [MY ACCOUNT](#) [INSTRUCTIONS](#)

List of Existing Lightweight Material Profile Design

String Included:

Search Design

District	County	Route No.	Culvert Width	Culvert Height	Existing Fill Height	New Fill Height	Soil Type	Soil Elastic Modulus	Soil Density	LWM Type	LWM Elastic Modulus	LWM Density	Submit By	Submit Date	Accepted Date
7	Bourbon	KY 32	11	10	40	46	Uniform Gravel	835475	99.911	Geofoam	13299.48	1.287			
6	Bracken	KY 55	10	10	25	30	Russell Clay	397733.3	118.645	Geofoam	13299.48	1.287	Charlie Sun	2023-10-15	
4	Breckinridge	US 60	10	11	30	35	Uniform-coarse Soil-Sand	522233.3	99.911	Foam Concrete	22600000	45			
7	Clark	KY 15	8	8	30	37	Russell Clay	397733.3	118.645	Geofoam	13299.48	1.287			
3	Simpson	KY 100	7	8	30	35	Russell Clay	397733.3	118.645	Shredded tire chips	21096	32.499			
3	Warren	CS 1004	8	10	10	15	Uniform-coarse Soil-Sand	522233.3	99.911	Shredded tire chips	21096	32.499			

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Figure 14. List of all existing designs sorted by County when the sub-link **All Existing Designs** is clicked

Users can view site detail information by clicking on an item in any column, such as **District**, **County**, **Route No.**, **Culvert Width**, **Culvert Height**, **Existing Fill Height**, **Soil Type**, **Soil Elastic Modulus**, **Soil Density**, **LWM Type**, **LWM Elastic Modulus**, or **LWM Density** from the list in Figure 14. Three (3) tabs are visible to users on the view design page —**Site Information**, **Design**, and **Attachments**.

4.4.1 Site Information – Shows site information

Figure 15 displays contents under the first tab, **Site Information**. Within this tab, you will discover site information encompassing details such as location, coordinates, route number, speed limit, milepost, and more.

The screenshot shows the 'Site Information' tab of the 'KYTC Lightweight Material on Culvert Design' web application. The page has a blue header with the KYTC logo and navigation links: HOME, EXISTING, NEW DESIGN, MY ACCOUNT, USER ADMIN, INSTRUCTIONS. The user is logged in as 'Hello, Charlie' on Wednesday, September 27, 2023. The 'Site Information' tab is selected, and a 'Modify Design' link is visible. The form contains the following fields:

- Designed By:** Charlie Sun
- Design Date:** 2023-08-20
- County:** Bourbon
- District:** 7
- Route No.:** KY 32 (e.g. US 27)
- Direction:** Southbound
- Speed Limit:** 60 M.P.H.
- Site Description:** Bourbon County Route KY 32 South
- MP from:** 23 **to:** 25
- Latitude:** 37.9648280000
- Longitude:** 83.3456700000

Below the form is a diagram illustrating the culvert design. It shows a cross-section of the culvert with labels for 'New Fill Height', 'Existing Fill Height', 'Culvert Height', and 'Culvert Width'. A red dashed line indicates the 'Lightweight Material (LWM)' layer. A text box with a red border states: 'For the provided condition (in black color), the design under Design Tab will result in the installation of lightweight material with the profile shown in red.' The diagram also includes labels for 'Soil Elastic Modulus', 'Soil Density', and 'Friction Angle' for both existing and new fill conditions.

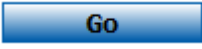
At the bottom of the form are buttons for 'Save', 'as Update', 'Delete', 'Submit', and 'Print Design Form'.

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Figure 15. Site detail information for project site

4.4.2 Design – Shows design for lightweight material installation profile

Figure 16 showcases the content found within the second tab, named **Design**. This tab comprises various sections, including Existing Condition, New Fill Condition, New Design Fill Profile, and Design Options. In Existing Condition, you can find details regarding the existing fill height, culvert size, and soil properties. New Fill Condition encompasses information on the new fill height, soil properties, and lightweight material (LWM)

properties. The design option listed beneath the  button is one utilizing a minimal amount of lightweight material, while the set at the bottom of the Design Options list aims to minimize excavation. Furthermore, there is a Print Design Form button that allows you to generate a design sheet for the current design in PDF format.

Saturday, October 14, 2023 | Hello, Charlie | [LOGOUT](#)



KYTC Lightweight Material on Culvert Design

[HOME](#) | [REGISTER](#) | [FAQ](#) | [CONTACT US](#) | [INSTRUCTIONS](#)

Design

[Modify Design](#)

Site Information
Design
Attachments

Existing Condition: Profile Design Case # (for retrieving different case only) 1 * Required field.

Existing Fill Height (ft.) 40

Culvert Width (ft.) 11

Culvert Height (ft.) 10

Soil Type Uniform Gravel

$E_{soil}(psf)$ 835475

Density_{soil}(pcf) 99.911

FrictionAngle_{soil} 34

New Fill Condition: Use Same Soil for New Fill

New Fill Height (ft.) 46

Soil Type Low plasticity Soil-Clay

$E_{soil}(psf)$ 41775

Density_{soil}(pcf) 118.645

FrictionAngle_{soil} 34

Lightweight Material Type Geofoam

$E_{LWM}(psf)$ 13299.48

Density_{LWM}(pcf) 1.287

New Design Fill Profile: Go

h (ft.) 19 ☐ h fixed if this box checked. h = Fill Height above LWM

t (ft.) 5 ☐ t fixed if this box checked. t = Thickness of LWM

L (ft.) 45 ☐ L fixed if this box checked. L = Length of LWM

d (ft.) 22 ☐ d fixed if this box checked. d = Distance between Culvert Top and LWM Bottom

This design utilizes a minimal amount of lightweight material.

Check Design:

Top Panel Target Ratio: 0.8473

Top Panel New Design Ratio: 0.84168 Pass or Fail: Pass

Side Wall Target Ratio: 0.8639

Side Wall New Design Ratio: 0.86331 Pass or Fail: Pass

Design Options:

Option#	TopRatio	WallRatio	h	t	L	d
01	0.84168	0.86331	19.0	5.0	45.0	22.0
02	0.84302	0.86321	17.0	6.0	40.0	23.0
03	0.80402	0.85862	6.0	8.0	56.0	32.0
04	0.80400	0.85968	5.0	9.0	57.0	33.0
05	0.82644	0.86167	4.0	7.0	59.0	35.0
06	0.82723	0.86262	3.0	7.0	60.0	36.0
07	0.82802	0.86354	2.0	7.0	61.0	37.0 - This design involves minimal excavation.

Save
as Update
Delete
Submit
Print Design Form

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Figure 16. The Existing Condition, New Fill Condition, New Design Fill Profile, and Design Options shown under **Design** tab

4.4.3 Attachments – Shows uploaded attachments by Designer

On the **Attachments** tab, the user may view or download attachments about this design uploaded by the Designer (Figure 17). Clicking on a file name will view this attachment.

The screenshot displays the 'KYTC Lightweight Material on Culvert Design' web application. The top navigation bar includes links for HOME, EXISTING DESIGN, MY ACCOUNT, and INSTRUCTIONS. The user is logged in as 'Charlie Sun' on Sunday, October 15, 2023. The 'Attachments' tab is selected and circled in red. A red watermark 'Attachments' is overlaid on the content. Below the tab, a message states: 'Select the attachment you wish to open and click on the file name. A window appears asking DO YOU WANT TO SAVE THIS FILE? that means you must save the file to your hard drive and then open it from your hard drive. We apologize for the inconvenience.' A table titled 'Attached Files for This Design' lists three files: 'LWMonCulvertDesign.PNG', 'LWMonCulvertDesign2.PNG', and 'LWMonCulvertDesign3b.PNG'. Each file is associated with a size, uploaded by 'Charlie Sun', and the organization 'University of Kentucky'. A 'Print Design Form' button is located below the table. The footer contains copyright information for 2023 and links to the Geotechnical Branch, KYTC Division of Structural Design, Kentucky Transportation Cabinet, and Kentucky Transportation Center.

File Name	Type	Size	Uploaded By	Organization	Date
LWMonCulvertDesign.PNG	image/png	89643	Charlie Sun	University of Kentucky	Oct 15, 2023
LWMonCulvertDesign2.PNG	image/png	1625761	Charlie Sun	University of Kentucky	Oct 15, 2023
LWMonCulvertDesign3b.PNG	image/png	1596547	Charlie Sun	University of Kentucky	Oct 15, 2023

Figure 17. Layout under **Attachments** Tab

4.5 NEW DESIGN – Create and Submit a new profile design for lightweight material installation

The **Designer** can start a new profile design for lightweight material installation profile by clicking the **NEW DESIGN** link. The page displayed in Figure 18 appears once a user clicks this link. The tabs, **Site Information** and **Design** are presented upon opening the link. The figure displayed under the **Site Information** tab illustrates information needed for lightweight material installation design.

The screenshot shows the 'KYTC Lightweight Material on Culvert Design' web application. The 'Site Information' tab is selected, displaying various input fields for project data. A diagram illustrates the cross-section of a culvert with fill material and lightweight material (LWM) layers.

Site Information Form Fields:

- Designed By: Charlie Sun
- Design Date: 2023-10-15
- County: Please Select ...
- District: [Gray background]
- Route No.: [Gray background] e.g. US 27
- Direction: Please Select ...
- Speed Limit: [Gray background] M.P.H.
- Site Description: [Gray background]
- MP from: [Gray background] to: [Gray background]
- Latitude: [Gray background]
- Longitude: [Gray background]

Diagram Labels:

- New Fill Height
- Existing Fill Height
- Culvert Height
- Culvert Width
- Lightweight Material (LWM)
- For the provided condition (in black color), the design under Design Tab will result in the installation of lightweight material with the profile shown in red.

Buttons: Save, [BS New Design], Reset

Figure 18. Screen for inputting a new site information

The tabs contain three kinds of entry fields:

1. Required Fields are denoted with *
2. Field with gray background
 - Ignorable fields will be automatically filled by application when user inputs corresponding information.
3. Fields without any mark:
 - Optional fields — information can be entered into them, or they can be left blank.

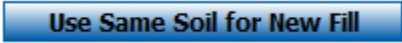
4.5.1 Site Information – Entering site information

Upon clicking the **NEW DESIGN** link, certain fields are conveniently pre-selected or come with default values for ease of use. The **Designed By** field is pre-filled with user's name, while the **Design Date** automatically displays the current date.

Additionally, the **District** field is automatically populated once a **county** selection is made. The **Site Description** is thoughtfully pre-filled based on the information entered in the **County**, **Route No.**, and **Direction**. If necessary, the information within the **Site Description** field can be edited to ensure its accuracy.

4.5.2 Design – Entering design parameters and populating design results

This tab serves as an interface to input essential conditions and parameters for generating a lightweight material installation profile. The existing condition includes details such as the Existing Fill Height, culvert size, and soil properties.

If the soil used for the new fill matches that of the existing fill, a convenient option labeled  is provided. Clicking this button automatically populates the new fill condition with the existing soil properties. However, if a different soil is to be used in the new fill, the user can manually input the corresponding soil properties in the new fill condition section.

In addition to soil properties, crucial details for the new fill condition encompass the New Fill Height and the properties for the lightweight material (LWM). Once all necessary data

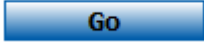
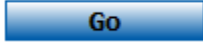
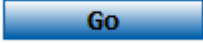
is entered, clicking on the  button initiates the creation of design results for the lightweight material installation profile. These results include multiple option sets for parameters like Fill Height above LWM (h), Thickness of LWM (t), Length of LWM (L), and Distance between Culvert Top and LWM Bottom (d). The set immediately below the  button corresponds to the design that utilizes the minimal amount of lightweight material, while the set at the bottom of the Design Options list corresponds to the design involving minimal excavation.

Figure 19 provides an illustrative example of the data entered, and it represents the moment when the  button has been clicked to initiate the design process for a new site.

Sunday, October 15, 2023 | Hello, Charlie | [LOGOUT](#)



KYTC Lightweight Material on Culvert Design

[HOME](#) [EXISTING DESIGN](#) [NEW DESIGN](#) [MY ACCOUNT](#) [USER ADMIN](#) [INSTRUCTIONS](#)

[Site Information](#) **Design**

New Design

Existing Condition: Profile Design Case # (for retrieving different case only) 1 * Required field.

Existing Fill Height (ft.)* 25 Culvert Width (ft.)* 10 Culvert Height (ft.)* 10

Soil Type* Russell Clay $E_{soil}(psf)$ * 397733.30 $Density_{soil}(pcf)$ * 118.645 FrictionAngle_{soil} 26.20

New Fill Condition: Use Same Soil for New Fill

New Fill Height (ft.)* 30

Soil Type* Uniform-coarse Soil-Sand $E_{soil}(psf)$ * 522233.30 $Density_{soil}(pcf)$ * 99.911 FrictionAngle_{soil} 34.00

Lightweight Material Type* Geofoam $E_{LWM}(psf)$ * 13299.48 $Density_{LWM}(pcf)$ * 1.287

New Design Fill Profile: Go

h (ft.) 14 ☐ h fixed if this box checked. h = Fill Height above LWM

t (ft.) 5 ☐ t fixed if this box checked. t = Thickness of LWM

L (ft.) 37 ☐ L fixed if this box checked. L = Length of LWM

d (ft.) 11 ☐ d fixed if this box checked. d = Distance between Culvert Top and LWM Bottom

This design utilizes a minimal amount of lightweight material.

Check Design:

Top Panel Target Ratio: 0.85457 Top Panel New Design Ratio: 0.69612 Pass or Fail: Pass

Side Wall Target Ratio: 0.86573 Side Wall New Design Ratio: 0.86554 Pass or Fail: Pass

Design Options:

Option#	TopRatio	WallRatio	h	t	L	d
01	0.69612	0.86554	14.0	5.0	37.0	11.0
02	0.85392	0.85366	5.0	5.0	48.0	20.0
03	0.85475	0.85843	4.0	5.0	49.0	21.0
04	0.85558	0.86281	3.0	5.0	50.0	22.0
05	0.85642	0.85835	2.0	5.0	52.0	23.0

05 - This design involves minimal excavation.

Save
New Design
Reset

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Figure 19. Example of data entered for a new design

4.5.3 Save Button

Clicking the **Save** button saves a design for lightweight material installation profile after all required data have been entered and the **Go** button has been clicked. One more tab, one dropdown list, and three more buttons are brought up after the **Save** button is clicked (Figure 20). Users can upload attachments to the server by using functions on the **Attachments** tab. They can save the design *as Update*, *as New Case*, or *as New Site* by choosing the appropriate option in the dropdown list. Users can delete the current design by clicking **Delete**, submit current design by clicking **Submit**, and print out the Design Form by clicking **Print Design Form**.

Sunday, October 15, 2023 | Hello, Charlie | [LOGOUT](#)



KYTC Lightweight Material on Culvert Design



[HOME](#) | [EXISTING DESIGN](#) | [NEW DESIGN](#) | [MY ACCOUNT](#) | [USER ADMIN](#) | [INSTRUCTIONS](#)

[Modify Design](#)

Site Information
Design
Attachments

Existing Condition: Profile Design Case # (for retrieving different case only) 1 * Required field.

Existing Fill Height (ft.) 25 Culvert Width (ft.) 10 Culvert Height (ft.) 10

Soil Type Russell Clay $E_{soil}(psf)$ 397733.3 $Density_{soil}(pcf)$ 118.645 FrictionAngle_{soil} 26.2

New Fill Condition: Use Same Soil for New Fill

New Fill Height (ft.) 30

Soil Type Uniform-coarse Soil-Sand $E_{soil}(psf)$ 522233.3 $Density_{soil}(pcf)$ 99.911 FrictionAngle_{soil} 26.2

Lightweight Material Type Geofoam $E_{LWM}(psf)$ 13299.48 $Density_{LWM}(pcf)$ 1.287

New Design Fill Profile: Go

h (ft.) 14 ☐ h fixed if this box checked, h = Fill Height above LWM

t (ft.) 5 ☐ t fixed if this box checked, t = Thickness of LWM

L (ft.) 37 ☐ L fixed if this box checked, L = Length of LWM

d (ft.) 11 ☐ d fixed if this box checked, d = Distance between Culvert Top and LWM Bottom

Check Design:

Top Panel Target Ratio: 0.85457 Top Panel New Design Ratio: 0.69612 Pass or Fail: Pass

Side Wall Target Ratio: 0.86573 Side Wall New Design Ratio: 0.86554 Pass or Fail: Pass

Design Options:

Option#	TopRatio	WallRatio	h	t	L	d
01	0.69612	0.86554	14.0	5.0	37.0	
02	0.85392	0.85386	5.0	5.0	48.0	
03	0.85475	0.85843	4.0	5.0	49.0	
04	0.85558	0.86281	3.0	5.0	50.0	
05	0.85642	0.86835	2.0	5.0	51.0	

23.0 - This design involves minimal excavation

Save
as Update
Delete
Submit
Print Design Form

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Figure 20. More functions show up after **Save** Button is clicked

4.5.4 Attachments – Uploading and managing Attachments

After saving a design data and results, Designers can upload attachments (e.g., pictures; .PDF, .doc, or .zip files) using the page shown in Figure 21 and following these steps:

1. Click **Browse** to identify a file to upload.
2. Click **Upload** to send the selected file to the web application server.

Site Information | Design | **Attachments**

Select the attachment you wish to open and click on it. If a window appears asking DO YOU WANT TO SAVE THIS FILE? that means you must save the file to your hard drive and then open it from your hard drive. We apologize for the inconvenience.

Attached Files for This Design

File Name	Type	Size	Uploaded By	Organization	Date	Delete
LWMonCulvertDesign.PNG	image/png	89643	Charlie Sun	University of Kentucky	Oct 15, 2023	☐
LWMonCulvertDesign2.PNG	image/png	1625761	Charlie Sun	University of Kentucky	Oct 15, 2023	☐
LWMonCulvertDesign3b.PNG	image/png	1596547	Charlie Sun	University of Kentucky	Oct 15, 2023	☐

Upload File/Files (Pictures, .pdf, .doc, or .zip)

Select a file: No file selected.

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Figure 21. Upload and manage attachments under **Attachment** tab

4.5.5 Save Option Dropdown List

The **Save Option Dropdown List** encompasses three distinct save options, namely **as Update**, **as New Case**, and **as New Design**. By selecting **Save as New Case**, users can append a new case to the existing design while preserving some site information. On the other hand, opting for **Save as New Design** establishes an entirely new site, initialized with certain shared data from the current site.

4.5.6 Delete Button

Clicking the **Delete** button deletes the current site information. It begins a new design for lightweight material installation profile after deleting.

4.5.7 Submit Button

Users will send a design for lightweight material installation profile to Central Office Lightweight Material on Culvert Design (LWMCD) Manager after they click the **Submit** button. When users successfully submit their survey form, emails with the **Design Form** attached as a PDF file are sent to the **Central Office LWMCD Manager** and **Designer**. The message “*Your Lightweight Profile Design has been successfully submitted. Thank you.*” appears onscreen. All the information for the current design is locked. No one can make changes.

4.5.8 Print Design Form Button

Clicking the **Print Design Form** button creates a PDF version of the **KYTC Lightweight Material on Culvert Design Form** (Figure 22). Users can save this file on their local hard drive or open it onscreen using software for viewing PDFs (e.g., Adobe Reader or Acrobat) and save it later. The printed form is identical to the form sent to **Central Office LWMCD Manager**.



KYTC Lightweight Material on Culvert Design



KENTUCKY TRANSPORTATION CABINET GEOTECHNICAL BRANCH, DIVISION OF STRUCTURAL DESIGN

Site Information:

Design By Charlie Sun Design Date 2023-10-15
County Bracken District 6
Route No. KY 55 Direction Eastbound
Speed Limit 55 MPH Site Description Bracken County; Route: KY 55; Northbound
MP from 22 to 33 Latitude 38.7598500 Longitude 83.8619230

Existing Condition:

Existing Fill Height (ft.) 25 Culvert Width (ft.) 10 Culvert Height (ft.) 10
Soil Type Russell Clay E (psf) 397733.3 Density (pcf) 118.645 Friction Angle 26.2

New Fill Condition:

New Fill Height (ft.) 30
Soil Type Uniform-coarse Soil-Sand E (psf) 522233.3 Density (pcf) 99.911 Friction Angle 26.2
LWM Type Geofoam LWM Elastic Modulus (psf) 13299.48 LWM Density (pcf) 1.287

New Design Fill Profile (with a minimal amount of lightweight material, or selected by user):

h (ft.) 14 -- Fill Height above lightweight material
t (ft.) 5 -- Thickness of lightweight material
L (ft.) 37 -- Length of lightweight material
d (ft.) 11 -- Distance between Culvert Top and Bottom of Lightweight Material Layer

Check Design:

Top Panel Target Ratio: 0.85457 Top Panel New Design Ratio: 0.69612 Pass
Side Wall Target Ratio: 0.86573 Side Wall New Design Ratio: 0.86554 Pass

Design Options:

Option#	TopRatio	WallRatio	h	t	L	d
01	0.69612	0.86554	14.0	5.0	37.0	11.0
02	0.85392	0.85386	5.0	5.0	48.0	20.0
03	0.85475	0.85843	4.0	5.0	49.0	21.0
04	0.85558	0.86281	3.0	5.0	50.0	22.0
05	0.85642	0.85035	2.0	5.0	52.0	23.0

involves minimal excavation.

Submit By Charlie Sun

Submit Date 2023-10-15

This Design has not been accepted yet.

10/15/2023 11:04 PM

Figure 22. KYTC Lightweight Material on Culvert Design Form in PDF format

4.6 MY ACCOUNT -- *Modify Personal Information*

Clicking **MY ACCOUNT** brings up the page depicted in Figure 23. A registered user can update their profile and change their password or contact information on this page (except for their email address, which serves as the user ID).

KYTC Lightweight Material on Culvert Design

Sunday, October 15, 2023 | Hello, Charlie | [LOGOUT](#)

[HOME](#) [EXISTING DESIGN](#) [NEW DESIGN](#) [MY ACCOUNT](#) [USER ADMIN](#) [INSTRUCTIONS](#)

My Account

Please provide following information to update your account

User Email: [charlie.sun@uky.edu](#)

Password: [Change Password](#)

First Name:

Last Name:

Phone Number:

Fax Number (optional):

Web Site (optional):

Address 1 Street Number Street Name:

Address 2 (optional):

City:

State:

Zip Code:

Country:

Organization:

Description:

* Required Fields

[Update](#) [Cancel](#)

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Figure 23. Update user's account from **MY ACCOUNT** link

5. USER AS A CENTRAL OFFICE LWMCD MANAGER

The **Central Office LWMCD Manager** has the most user privileges in the web application. In addition to the links **Designers** can access, the **Central Office LWMCD Manager** sees the following links on the **Header** after logging in: **USER ADMIN** → (**User Admin**, **User List** and **Groups**) – see Figure 24. The **Central Office LWMCD Manager** has final authority to accept or request changes for design. **USER ADMIN** → (**User Admin**, **User List** and **Groups**) links to pages for maintaining all the information of registered users and groups. On these pages, new users can be added and information for existing users can be modified. On all pages listing existing sites, the **Central Office Manager** can activate or archive sites. Attachments can be managed on the **Attachments** tab. To learn how to navigate privileges available to **Designers**, refer to the following sections:

4.3 Starting Page after LOGIN

4.5 NEW DESIGN – *Create and Submit a new profile design for lightweight material installation*



Figure 24. **Header** – after a **Central Office Manager** logs in

5.1 Screen for Managing Existing Design List

On the page listing existing designs, the **Central Office LWMCD Manager** can archive or activate a lightweight material profile design by checking or unchecking the archive checkbox and clicking the **Update** Button (Figure 25). The **Central Office LWMCD Manager** can click on **Retrieve Archive** or **Retrieve All** to view different groups of lightweight material profile designs.

The screenshot displays the 'KYTC Lightweight Material on Culvert Design' web application interface. At the top, there is a navigation bar with links: HOME, EXISTING DESIGN, NEW DESIGN, MY ACCOUNT, USER ADMIN, and INSTRUCTIONS. The main heading is 'List of Existing Lightweight Material Profile Design'. Below this, there is a search bar with 'String Included:' and a 'Search Design' button. The main content is a table listing design details. A red box highlights the 'Archive' checkbox in the 'Archived' column for the first three rows. Another red box highlights the 'Retrieve Archive', 'Retrieve All', and 'Update' buttons at the bottom of the table, labeled 'Function Buttons'. A red diagonal watermark 'Archive Checkbox' is also present across the table.

District	County	Route No.	Culvert Width	Culvert Height	Existing Fill Height	New Fill Height	Soil Type	Soil Elastic Modulus	Soil Density	LWM Type	LWM Elastic Modulus	LWM Density	Submit By	Submit Date	Accepted Date	Archived
7	Bourbon	KY 32	11	10	40	46	Uniform Gravel	835475	99.911	Geofoam	13299.48	1.287				☐
6	Bracken	KY 55	10	10	25	30	Russell Clay	397733.3	118.645	Geofoam	13299.48	1.287	Charlie Sun	2023-10-15		☐
4	Breckinridge	US 60	10	11	30	35	Uniform-coarse Soil-Sand	522233.3	99.911	Foam Concrete	22600000	45				☐
7	Clark	KY 15	8	8	30	37	Russell Clay	397733.3	118.645	Geofoam	13299.48	1.287				☐
3	Simpson	KY 100	7	8	30	35	Russell Clay	397733.3	118.645	Shredded tire chips	21096	32.499				☐
3	Warren	CS 1004	8	10	10	15	Uniform-coarse Soil-Sand	522233.3	99.911	Shredded tire chips	21096	32.499				☐

Function Buttons: [Retrieve Archive](#) [Retrieve All](#) [Update](#)

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Figure 25. Archive/active designs by a Central Office Manager

5.2 Screen for Managing Attachments

The **Central Office LWMCD Manager** can review or download attachments that have been uploaded by the **Designer** on the design page's **Attachment** tab. Following review, they can decide whether to delete the attachment by checking the appropriate box. Upon making their selection(s), **Central Office LWMCD Manager** should proceed by clicking the **Update Attachments** button to complete the necessary action (Figure 26).

Site Information Design **Attachments** Accept

Select the attachment you wish to delete or if a window appears asking DO YOU WANT TO SAVE THIS FILE? that means you must save the file to your hard drive and then open it from your hard drive. We apologize for the inconvenience.

Attached Files for This Design

File Name	Type	Size	Uploaded By	Organization	Date	Delete
LWMonCulvertDesign.PNG	image/png	89643	Charlie Sun	University of Kentucky	Oct 15, 2023	☐
LWMonCulvertDesign2.PNG	image/png	1625761	Charlie Sun	University of Kentucky	Oct 15, 2023	☐
LWMonCulvertDesign3b.PNG	image/png	1596547	Charlie Sun	University of Kentucky	Oct 15, 2023	☐

Upload File/Files (Pictures, .pdf, .doc, or .zip)

Select a file: No file selected.

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Figure 26. Manage attachments by Central Office Manager

5.3 Accept or Request Changes – Central Office LWMCD Manager's Decision

After the **Central Office LWMCD Manager** logs in, if a lightweight material installation profile design is awaiting their acceptance, the portion of **Central Office Manager's Decision** under **Accept** tab will be active (Figure 27). After deciding to **Accept** or **Request Changes**, the **Central Office LWMCD Manager** fills out the corresponding information and clicks the **Submit** button. Once submitted, individual emails containing the **Design Form** in PDF format are sent to the **Designer** who submitted the profile design. A copy of this email is sent to the **Central Office LWMCD Manager** for recordkeeping purposes.

If the **Central Office LWMCD Manager** requests changes, emails which include suggestions or modifications for further consideration are sent to the **Designer**.

The screenshot displays the 'KYTC Lightweight Material on Culvert Design' web application. The top navigation bar includes links for HOME, EXISTING DESIGN, NEW DESIGN, MY ACCOUNT, USER ADMIN, and INSTRUCTIONS. The 'View Design' section is active, showing the 'Accept' tab selected. The form contains fields for County (Bracken), District (6), Route No. (KY 55), Route Direction (Northbound), Existing Fill Height (25), Culvert Width (10), Culvert Height (10), New Fill Height (30), and Submit By (Charlie Sun). A table of Design Results is shown, with columns for Option#, TopRatio, WallRatio, h, t, L, and d. The 'Central Office Manager's Decision' section includes radio buttons for 'Accept' and 'Request Changes', a comments field (limited to 120 characters), and a 'Submit' button. A red watermark 'The Portion for Central Office Manager's Decision' is overlaid on the form. The footer contains copyright information for 2023 Kentucky Transportation Cabinet.

Option#	TopRatio	WallRatio	h	t	L	d
01	0.69612	0.86554	14.0	5.0	37.0	11.0
02	0.85392	0.85386	5.0	5.0	48.0	20.0
03	0.85475	0.85843	4.0	5.0	49.0	21.0
04	0.85558	0.86281	3.0	5.0	50.0	22.0
05	0.85642	0.85835	2.0	5.0	52.0	23.0

Figure 27. Central Office Manager submits their decision

5.4 USER ADMIN – User Administration

In the **Header** section, the **Central Office LWMCD Manager** has access to **USER ADMIN → User Admin**. Clicking on this link brings up the **User Administration** page. This page contains three tabs — **Pending Designer**, **All Existing Users**, and **Add New User**. Figure 28 displays the **Pending Designer** tab, which lets the **Central Office LWMCD Manager** approve or delete pending requests for **Designer** by clicking the corresponding buttons.

The screenshot shows the 'User Administration' page for 'KYTC Lightweight Material on Culvert Design'. The top navigation bar includes links for HOME, EXISTING DESIGN, NEW DESIGN, MY ACCOUNT, USER ADMIN, and INSTRUCTIONS. The 'USER ADMIN' tab is active. Below the navigation bar, the 'Pending Designer' tab is selected, showing 'Designer Requests Unverified'. A dropdown menu displays 'charlie.sun@uky.edu'. Below the dropdown are two buttons: 'Approve Designer' and 'Delete Designer'. A red box highlights the user information displayed below the buttons, including: Creation Date: 8/23/2023 12:00:00 AM, User Email: charlie.sun@uky.edu, User Type: Designer, First Name: Charlie, Last Name: Sun, Phone: 859-257-7330, Address1: 277 Raymond Building, Address2: City: Lexington, State: KY, Zip Code: 40506, Country: USA, Organization: University of Kentucky, User Group: Unsigned, and Description: Any description. Below this information, it says 'UserTBA Requests Unverified' and 'No Approval pending'. Red annotations are present: 'Pending Submitter Tab' points to the 'Pending Designer' tab; 'Approve/Delete selected Designer' points to the two buttons; and 'Selected user's information' points to the user details box. The footer contains copyright information for 2023 Kentucky Transportation Cabinet.

Figure 28. User Administration page with **Designer** in pending

5.4.1 Pending Designer -- Approve/Reject Pending Designer

The area on this tab depends on whether **Designer** requests are pending. These situations arise only when a user has registered on web application management system but not activated their account yet. If there are users who have not activated their accounts, dropdown lists appear. When the dropdown list under **Designer Requests Unverified** is clicked and a user is selected, the user information appears as seen in Figure 28.

The **Central Office LWMCD Manager** may approve a **Designer**'s request by selecting correct user group and clicking the **Approve Designer** button. They can reject or delete a request by clicking the **Delete Designer** button. If a **Designer** is approved, the web application management system sends an email to the **Designer** notifying them of the approval. If there are no requests pending, "No Approval pending" appears under **Designer Requests Unverified**.

5.4.2 All Existing Users -- Maintain All Registered User's Information

A second tab — **All Existing Users** — provides the **Central Office Manager** with a dropdown list of all existing registered users. When a user is selected from the dropdown list, their personal information appears beneath the dropdown list, which the **Central Office LWMCD Manager** can modify (Figure 29). The **Central Office LWMCD Manager** can save changes to a user's profile by clicking the **Update** button; change their status by clicking the **Change Status** button; or reset their password by clicking the **Reset Password** button. Clicking the **Reset Password** sends the selected user an email with a new password automatically generated by the system.

KYTC Lightweight Material on Culvert Design

Sunday, October 15, 2023 | Hello, Charlie | [LOGOUT](#)

[HOME](#) [EXISTING DESIGN](#) [NEW DESIGN](#) [MY ACCOUNT](#) [USER ADMIN](#) [INSTRUCTIONS](#)

User Administration

[Pending Designer](#) **All Existing Users** [Add New User](#)

All Existing Users

University of Kentucky, Charlie Sun, charlie1658@gmail.com - UserTBA, Active

User Email: charlie1658@gmail.com [Check Availability](#)

First Name: Charlie

Last Name: Sun

User Type: UserTBA

User Group: UK Development

Phone Number: xxx-xxx-xxxx 859-227-8363

Fax Number (optional): 859-257-1840

Web Site (optional):

Address1: Street Number Street Name 277 Taylorsville

Address2 (optional): Lexington

State: KY

Zip Code: 40503

Country: USA

Organization: University of Kentucky

Description: Try some functions

[Update](#) [Cancel](#) [Reset Password](#) [Change Status](#)

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Figure 29. User info appears when user is selected on **All Existing Users** tab

5.4.3 Add New User -- Add/Invite New User

Clicking the **Add New User** button lets the **Central Office LWMCD Manager** registering and activating a new user on their behalf (Figure 30). This user does not need to activate their account and can directly login to the web application via the **LOGIN** link. This page looks nearly identical to the **Registration** page seen in Figure 2 except the **Central Office LWMCD Manager** can select **User Type** and **Group** for the invited user directly. No activation from user's side is needed. After clicking **Register**, the web application management system instantly sends an email to the invited user that includes the **LOGIN** link.

The screenshot displays the 'Add New User' tab in the KYTC Lightweight Material on Culvert Design web application. The page header includes the KYTC logo, the application title, and navigation links: HOME, EXISTING DESIGN, NEW DESIGN, MY ACCOUNT, USER ADMIN, and INSTRUCTIONS. The user is logged in as 'Hello, Charlie' on Sunday, October 15, 2023. The 'Add New User' tab is highlighted with a red box and labeled 'Add New User Tab'. The form titled 'Please provide following information to create a new account' contains the following fields: First Name, Last Name, Email (with a 'Check Availability' button), Password, Retype Password, Phone Number, Fax Number, Web Site, Address1 (Street Number, Street Name), Address2, City, State, Zip Code, Country, and Organization. The 'User Type' dropdown is set to 'Designer' and is highlighted with a red box and labeled 'User Type'. The 'User Group' dropdown is set to 'Administrator' and is highlighted with a red box and labeled 'User Group'. A 'Description' text area is also present. The form includes a 'Required Fields' indicator and 'Register' and 'Reset' buttons at the bottom. The footer contains copyright information for 2023 Kentucky Transportation Cabinet.

Figure 30. Add New User tab lets **Central Office Manager** to add/invite new users

5.5 USER List

The **Central Office LWMCD Manager** has access to the **USER ADMIN → User List** link in the **Header**. Clicking this link takes the **Central Office LWMCD Manager** to the **User List** page (Figure 31). On this page, the **Central Office LWMCD Manager** can search users by using any string included in any fields. All titles of columns function like “**sort by**” key when any title is clicked. The **Central Office LWMCD Manager** can copy users’ email addresses by selecting the checkboxes in front of users and clicking the button of **Copy Selected Email Addresses**. They can go to user detail page and modify their data by clicking on a user.

String Search

User List

Titles work as sort by keys

Select	First Name	Last Name	Email Address	Phone No.	Organization	Street	City	State	RegisterDate	Active
☒	Mike	Carpenter	mike.carpenter@ky.gov	(502) 564-2374	KYTC	1236 Wilkinson Blvd	Frankfort	KY	2022-9-26	☒
☒	Erik	Scott	erik.scott@ky.gov	(502) 564-2374	KYTC	1236 Wilkinson Blvd	Frankfort	KY	2022-8-23	☒
☒	James	Wilhoite	James.Wilhoite@ky.gov	(502) 564-2374	KYTC	1236 Wilkinson Blvd	Frankfort	KY	2022-8-25	☒
☒	Tyler	Sheffield	Tyler.Sheffield@ky.gov	(502) 792-4083	KYTC	1236 Wilkinson Blvd	Frankfort	KY	2022-8-26	☒
☒	Tony	Beckham	Tony.Beckham@ky.gov	(502) 564-2374	KYTC	1236 Wilkinson Blvd	Frankfort	KY	2022-8-26	☒
☐	Charlie	Sun	charlie.sun@uky.edu	859-257-7330	University of Kentucky	277 Raymond Building	Lexington	KY	2022-7-27	☒
☐	Charlie	Sun	charlie1658@gmail.com	859-227-8363	University of Kentucky	277 Raymond Building	Lexington	KY	2022-8-27	☒

Function Buttons

Retrieve Inactive Retrieve All Update

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Figure 31. **USER ADMIN → User List** page provides **Central Office Manager** an interface maintaining user information and copy user email addresses

5.6 GROUP ADMIN – *Group Administration*

The **Central Office LWMCD Manager** has access to the **USER ADMIN → Groups** link in the **Header**. Clicking this link takes the **Central Office LWMCD Manager** to the **User Group List** page (Figure 32). On this page, the **Central Office LWMCD Manager** can modify existing groups' information and add new groups.

KYTC Lightweight Material on Culvert Design

HOME EXISTING DESIGN NEW DESIGN MY ACCOUNT USER ADMIN INSTRUCTIONS

User Group List

Group Name	Group ID
KYTC District 1	1
KYTC District 2	2
KYTC District 3	3
KYTC District 4	4
KYTC District 5	5
KYTC District 6	6
KYTC District 7	7
KYTC District 8	8
KYTC District 9	9
KYTC District 10	10
KYTC District 11	11
KYTC District 12	12
KYTC Central Office	20
JK Development	21
TBA	927

Group Name

Group ID

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Figure 32. **USER ADMIN → Groups** page provides **Central Office Manager** an interface maintaining group information

6. USER AS AN ADMINISTRATOR

An **Administrator** is an assistant to the **Central Office LWMCD Manager** in the web application. The **Administrator** can perform all functions available to the **Central Office LWMCD Manager** except receiving email when the Designer submits a lightweight material installation profile design. Only the **Central office LWMCD Manager** will get this email.

7. LOGOUT

The **LOGOUT** link appears in the upper right corner of every page of the web application. When a user clicks a **LOGOUT** link, the system deletes all session variables, and a fresh session begins. The user is then redirected to the original **HOME** page. To reenter the site, the user must click the **LOGIN** link in the upper right corner of the page and enter their **Email Address** and **Password**.

If you have questions or need assistance with the KYTC Lightweight Material on Culvert Design web application, please contact:

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